ACTA RADIOLOGICA

EDITA PER SOCIETATES RADIOLOGICAS DANIÆ, FENNIÆ, HOLLANDIÆ, NORVEGIÆ ET SUECIÆ

VOL. IV FASC. 6 15: XII 1925 N:o 22

MODERATELY DEEP RADIOTHERAPY

A Paper read at the Congress of the French Association for the Advancement of Science, held at Grenoble, July—August 1925

by

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Since the so-called »deep» radiotherapy has reached its present, indiscutably very high degree of development, the less penetrating radiotherapy seems to have been more or less forgotten. Most physicians, and some radiologists, look on the methods that have preceded the »deep» therapy merely as stages in the evolution of radiology — stages which, to-day, are only of historical interest. In coming to this view of the matter they have undoubtedly been led, to a great extent, by the great number of the works that have been published on the subject of deep therapy; the importance of those writings simply effacing from memory all that had been done previously to the introduction of the latter. And those who still hesitated were convinced, in the end, by reading the assurances — mostly in foreign publications — as to how it was possible, by means of this deep therapy, to treat and cure superficial and deepseated lesions alike, under conditions of security hitherto unknown.

In my opinion, the view thus expressed is not only erroneous, but is also a highly dangerous one not only as regards the future of radiotherapy but also as regards the health of the patients; this is why I have not hesitated to accept the task of writing a paper on the subject. My object is not to hold up the slightly penetrating — or »moderately deep» — radiotherapy in opposition to the present-day method of using two therapies are so different in their effects that the indications for their use must necessarily be separate and distinct for each of them.

When the radiotherapeutists have been unable to cure certain superficial affections which the classical works indicate as easily curable, it is simply because they have forgotten this difference.

Similary, in certain cases, disorders in the deeper structures have been caused by a uselessly penetrating radiation, when it would have been sufficient, in order to avoid accidents, to have used a more feebly penetrating and less searching dose.

For these various reasons, radiation treatment has, of recent years, lost ground as a therapy for superficial lesions. The dermatologists are afraid of it or else declare it to be ineffective. The responsibility for this development falls on those who have not had the wit to understand that one cannot irradiate for an eczema in the same manner as for a cancer of the uterus, or — in other words — that the word »radiotherapy» is not a univocal term but signifies a different idea and methods according to the situation, the nature and the development of the lesion in question.

It is true that the moderately penetrating therapy calls for a greater minuteness of application, and is far more difficult to operate with, than the so-called »deep» therapy. In the latter, the judicious choice of dose, of ports of exposure, are factors which require long experience and a perfect medical education. If the specialist makes a mistake — if he gives a little too much, or not quite enough — the result will suffer in consequence; but the patient — and, often, the physician himself — will not be able to appreciate the fact. How many failures of the deep therapy are not, in reality, due to faulty technique, to insufficient radiation, to a *defective technique* wielded by some unscrupulous »specialist»!

With the moderately deep therapy, using either a thin filter or none at all, conditions are very much different. The result is directly manifest, palpable and visible both to the patient and to the physician. If, in a case of ringworm, we depilate the scalp by means of the roentgen rays every bit of the necessary dose must be strictly given, otherwise the hairs will not come out. If, on the other hand, the exact dose is exceeded the skin will become red, desquamation and ulceration will set in, and the alopecia, instead of being only temporary, will become permanent. If a lichenificated eczema is imperfectly treated the affection will get worse, and the resulting radiodermatitic reaction will cause the patient to lose faith in the radiologist for ever after.

Those are the reasons why the deep therapy is seemingly — but *only* seemingly — easier than the older method, and why it has been more employed by many radiologists.

The moderately deep treatment — in spite of its difficulty, and

in spite of the real danger which it presents if faultily applied — ought to keep its place in radiotherapeutics.

After thus having tried to define it, let us look, first, at the principles on which it rests; then, afterwards, at the chief manners of its employment and the indications for its use.

The Different Radiation Therapies

The term »deep radiotherapy» is, in itself, incorrect and misleading, inasmuch as it suggests that only those roentgen rays that are obtained by means of voltages higher than 200,000 penetrate into the tissues.

One of the characters common to all roentgen rays is their faculty of passing through substances that are considered as opaque. Consequently, every radiation therapy is »deep» — by definition — in the sense that it passes through the intervening substances, giving off, in the course of that passage, a certain portion of its energy. But that absorption of energy depends, not only on the nature of the opposing substance, but also on the composition of the beam, and on the wave-length of the various rays which the latter contains.

In the least penetrating roentgen rays — easily absorbed by the walls of the tube and with a wave-length of about 12 Ångström units (AU) — no less than in the most strongly penetrating rays, with a wave-length of 0.05 AU., the complete spectrum is contained within the eight octaves which separate the outermost rays at either end.

This is as much as to say that, theoretically, there are just as many therapies as there are different wave-lengths; in fact there might be even a great deal more, if we took into account also the medium, effective wave-lengths; because the type of the high voltage current has an influence — still vaguely understood — on the composition of the beam.

It is therefore a most arbitrarious idea, of course, to mark off certain sections in this continuous spectrum, and to attribute to those particular parts of the scale — from one penetration to another — characteristics essentially different from the ones either above or below them.

For practical and preceptive reasons it has been tried, however, to establish certain divisions, thereby simplifying the radiological terminology.

To that end, the French Society of Medical Radiology, in 1925,

established three categories of radiation therapy.[1] The classification was based on the value of the wave-lengths, but taking into account not only the respective maxima and minima of those lengths, but also their »effective» length — or the maximum of energy after suitable filtration. In this manner, the following, very schematic distinction was made, between: (1) superficial therapy, (2) moderately deep therapy, and (3) deep therapy. The chief characteristics of each will be seen from the following table:

Therapy	Maximum voltage	Equivalent spark between points	Boundary wave-length (λ_0)	Filter	Maximum wave-length (value of λ)	Effective wave-lenght
Superficial . .	V < 50 kv.	L < 10 cm.	0.25 AU	3 mm. Aluminum	0.60 AU	0.35 AU
Moderately deep	V < 150 kv.	L < 50 cm.	0.08 AU	0.5 mm. Al. or Zinc	0.40 AU	0.15 AU
Deep	V > 200 kv.	L > 40 cm.	0.06 AU	1 mm. Al. or Zinc	0.20 AU	0.10 AU

This classification was criticised as being too arbitrary. It nevertheless had the great advantage that it brought some system into the matter, and that it made it impossible, henceforth, to consider radiation with voltages of less than 200,000 as very deep therapy. It rested on a base about which there could be no question: namely, the wave-length. And, furthermore, for each of the three categories the portion of the spectrum used was sharply defined, on the one hand by the maximum of voltage, and, on the other, by the nature and thickness of the filter. There is practically no overlapping of the spectral zones corresponding to each of these three great divisions of the roentgen therapy.

The table here reproduced does not give any special place to the voltages of from 150,000 to 200,000, and leaves out of consideration the rays of very feeble penetration having a minimum wave-length shorter than 0.6 AU. Practically no radiotherapeutic works is done with voltages of under 50,000. Still, it should be known that certain dermatologists, especially in Germany, have tried to make therapeutical use of tubes that work with a lower voltage. In order to counteract the absorption by the walls of the tube there is inserted in the latter, in the line of the projection of the beam, a thin sheet of glass very transparent to the roentgen rays — the »LINDEMANN

[1] Remarques présentées au nom de la Commission de thérapeutique, MM. BELOT, HARET, PROUST, SOLOMON, ZIMMERN et LEDOUX-LEBARD. Journal de Radiologie et Electrologie, Avril 1925, p. 185.

glass». I experimented with this device more than fifteen years ago, and I shall speak, in a moment, of the results which I obtained.

Quite recently, BUCKY has taken up this question afresh, in a paper entitled: »Superficial Radiotherapy by means of ultra-soft rays».[1] According to him, these rays should be, a priori, the most efficacious ones for dermatotherapeutical use. He states that a voltage of 9,000 is sufficient to produce a radiation capable of passing through the »LINDEMANN glass». With a voltage of 10,000 the absorption, per 0.5 mm. of skin, is at the rate of fifty per cent. He claims that this irradiation has a remarkable therapeutic effect on the dermatosis.

The views of BUCKY seem to be the result of reasoning more than of experience. From the experiments which I made myself, years ago, with gas-tubes fitted with a very transparent »window» (it should be added, however, that I used a tension of 60 kilovolts) I did not get any better results, all told, than from tubes without »window». Erythema resulted from a seemingly feebler dose, but the pigmentation persisted for a longer while. As regards the final result, the advantage seemed, to me, to lie with the ordinary tube. It is possible that with lower voltages the results might be different; the matter calls for further investigation.

Leaving aside every sort of theoretical consideration, and basing myself exclusively on the results of practical experience, I would distinguish between two great categories of radiotherapy. To the first of these — which I will call the »moderately deep therapy» — I would consider as belonging all applications made with the use of voltages ranging from 75,000 to 120,000, with respective minimum wave-lengths of from 0.16 to 0.10 AU. That is the old radiation therapy, as we had it before the war. Its practice has been made easier by the introduction of the COOLIDGE tube, which has made it possible not only to keep the chosen voltage constant during the whole period of irradiation, but — more important, still — and thanks to its capacity for standing a much higher tension — to increase the current and, thus considerably shorten the time required for the treatment. The COOLIDGE tube — which it takes only a very low voltage to »excite» — from the very principle of its construction gives a spectrum richer in rays of feeble penetration, and, in certain cases, necessitates a selective filtration sligthly different from the one which is suitable in connection with the gas tubes.

Above 120 or 130 kilovolts — though it is impossible to draw a precise line of demarcation — the radiation treatment can no longer

[1] Münchener Medizinischer Wochenschrift, 72, no. 20, p. 802, May 15th, 1925.

be considered as falling within the meaning of the term: *moderately deep* therapy. It approaches what is called *deep* therapy, and — by almost imperceptible degrees — becomes so in fact, as the current is gradually increased at the terminals of the tube.

Incidentally, I wish to register my protest against the term »ultra-deep» radiotherapy. It is not only incorrect, but it suggests that the limit of possible penetration has been reached, which is wrong.

To put the matter as simply as possible, and in words intelligible to all, I understand by a *moderately deep* therapy: the therapy which uses a tension corresponding to an equivalent spark from 15 to 25 cm. long.

The Absorption of the Rays

When a radiologist says that he uses 5 HOLZKNECHT units, of a no. 7 BENOIST radiation, he defines the amount of radiation that reaches the skin, but in no way indicates the amount which is absorbed by the organs traversed. The fraction absorbed by a given element depends, first of all, on the quality of the beam and on the greater or lesser degree to which the latter has been filtered. Knowledge of the mean wave-length, after the beam has passed the filter, will help to form an approximative idea of the manner in which the subsequent distribution of the radiation in the tissues will take place. By using, in connection with the water-phantom, two iontometers, one at the surface and the other at a depth of ten centimeters, for instance, it will be possible to figure out, by subtraction, how great a fraction of the radiation has been kept and, therefore in all probability, been partly absorbed. But even in this measurement we must take note of the variables due to secondary and diffused rays. The estimate which it is possible to form as regards a certain depth of water or other, »equivalent» substance, becomes exceedingly difficult when the problem is one of the human skin, and — all the more — when it is a question of the different layers composing the dermis and epidermis.

We can not be certain, even approximately, what of a 5 H. dose, of feeble penetration, is retained by the MALPIGHIAN layer of a cutaneous surface. But we know that a very considerable portion of the energy is absorbed by the superficial layers — because we have the visible manifestations of the fact in the erythema, the desquamation, the falling out of the hair, and all the rest of the reactions, intended or inseparable from radiotherapy of the skin. It is an interesting characteristic of those reactions that they disappear again after a recognised time, and that they generally do not

leave any trace in the form of permanent alterations of the cutaneous surface where they appeared.

If, instead of using rays with only a feeble power of penetration, we try to produce the same reactions by means of highly penetrant and strongly filtered rays, we shall have no end of difficulties. The reaction will be pigmentary rather than erythematous; it will be only sligthly painful, even if it should be attended with desquamation in spots of greater or lesser extent. To produce only a semblance of the other reaction it will be necessary, in this case, to use a dose of radiation five or six times as strong.

The secret of the whole problem lies in the value of the absorbed dose, and the confusion arises from the fact that it is the incidental dose — the dose of radiation — that is measured, and not the dose held back by the divers elements constituting the tissues, which are of unequal sensibility to radiation.

Now, nearly all superficial lesions of the skin have their origin either in the epidermis or in the superficial layers of the dermis. They very rarely go beneath the hypoderm. Keratomata, papillomata, dyskeratomata, hyperacanthoses, epitheliomata, etc., all begin in the layers that separate the stratum disjunctum from the corpus papillare; and it is a well known fact that the mucous portion of the MALPIGHIAN layer is particulary sensible to the roentgen rays. Folliculitis, acne, the local tuberculosis, all the chronic inflammations of the skin, and certain malignant tumors, have their origin in the dermis — in the corium or, more specifically, in the corpus papillare.

It is to these very superficial layers — which are the seat or, at any rate, the starting point of the disease — that the effective dose should be given, if one wishes to practice a rational therapy for any form of dermatosis.

While, in the deep radiotherapy for abdominal tumors, the point is to reduce to a minimum the dose absorbed by the skin and the intervening organs, the radiotherapy directed at superficial lesions aims at having the radiation, by absorption, expend the greatest possible amount of its energy in the surface layers, which, in principle, are the only ones that ought to be irradiated.

But — it will be objected! — there is nothing to prevent the skin from getting the same dose of radiation to absorb, regardless of the wave-length employed; it is simply a matter of selection, of calculation and of time. A priori, this does not sound impossible; but the trouble is that, with increasing frequency and selection of the radiation, there will be a tendency of the absorption to take place more uniformly throughout the various layers traversed; or — as

the physicist would put it: the complex exponential function will become simple by degrees. When we consider how very slight the distance is that separates the various layers, and the very unequal degree of radiosensibility possessed by the different elements of the skin, any differentiation of the dosage, from the outermost to the nethermost of those layers, seems a very difficult proposition, indeed. To an immediate consideration a therapy employing only rays of a maximum penetration not higher than 0.2 or 0.3 AU. might, therefore, seem preferable where the matter is one of merely cutaneous lesions. Still, the effect thus obtained might perhaps be too superficial, after all: leaving the middle layers of the dermis almost without stimulation or modification.

The question is one which cannot be solved either by calculation or by deductive reasoning. Practice, which is our great guide in this matter, shows that the results are infinitely inferior with deep therapy than when a softer and less sifted beam of radiation is used. On the other hand, it has not, as yet, given us any reason to believe that a very soft radiation would be in any way superior to the moderately penetrant one which I have just preconised.

But the principal argument against the deep therapy in connection with this category of lesions lies in the impossibility of avoiding action in the depth. Even supposing that we succeed in making the diseased tissues absorb an equal amount of energy, it is nevertheless certain that the underlying strata will be attained by the radiation to no use, and will, in many cases, even be injured thereby, inasmuch as it is a characteristic of the penetrant and sifted radiation to give off its energy, from the surface downwards, with only the slightest diminution of its intensity. This is so true that a depilation resulting from deep-therapeutic treatment is, in nearly every instance, attended with a slight atrophy of the skin, even if the hair grows out again.

Often, also, important underlying organs — glands, mucosæ and blood —, will undergo alterations. This is something which I recently had occasion to observe in connection with the treatment of GRAVES' disease. When one subjects the thyroid gland to irradiation by means of moderately penetrating rays (25 cm. spark-length) suitably filtered (1 cm. Al.) no cutaneous reaction is produced, nor is there any trouble as regards the mucosa of the larynx. If, on the contrary, one utilises — either for reasons of glandular resistance or merely from habit — a radiation of highly penetrating quality and strongly filtered — endeavouring, nevertheless, to carry out the whole treatment in such a manner that the thyroid gland will, in the same space of time as before, absorb practically the same dose of radiation — it

will be found — as might, indeed, be expected — that the patient will be complaining of a more or less painful sensation in the mucous membrane of his larynx. In the former case, that mucous membrane has been left almost entirely undisturbed; in the latter it was irritated or injured by the radiation. Those are facts so important that they sometimes balk all the efforts of the radiotherapeutist; in order to lessen their gravity he bends all his ingeniousness toward finding some way of attacking the lesions obliquely and, thus, avoiding to irradiate the underlying, delicate organs. For tumors of the mammæ, especially, it has recently been recommended to irradiate through a series of ports of entry just glancing the thorax, so as to lessen the risk of pulmonary sclerosis which will sometimes result from a too intensive treatment.

Deep radiotherapy, like the older, more superficial method, derives its value from the different degree of radiosensibility possessed by the various cellular elements, but it distributes blindly — along the whole path of its beam and, by diffusion, for a distance all around that path — a truly enormous energy. It is therefore necessary to use it only for those lesions to the cure of which it is *incontestably necessary.*

The Specificity of the Radiation

If it could be proved that the cellular elements, normal and pathologic, reacts only to the radiation of some specific wave-length, and are not influenced if that wave-length is either shortened or increased — then all that I have been saying in the foregoing would be of no more value. The therapy would be easier, because all we should have to do would be to apply to each affection the radiation of the corresponding, curative wave-length. It is a question which has long been debated, without anyone having yet been able to advance a decisive argument either for or against the theory of cellular electivity. To prove that electivity is extremely difficult, and for a long while yet, each one will no doubt cling to his own opinion. Still, the recent works by Friedrich and the American authors seem to show that the absorbed quantity is the most important factor. That is precisely the theory for which I have been a spokesman these twenty years, and to which my late, regretted friend, Guilleminot, adhered also. And patient observation of facts, of results and of reactions — viewed in the light of the, still incompletely known, laws of absorption — only confirm me in my original opinion. *For the present, at least, I do not believe that a particular cell-type reacts differently to equal doses of radiation because the wave-lengths of those radiations are different.*

The successes registered by the deep therapy have seemingly furnished an argument in favor of the theory of electivity. But it is a question whether the reason of those successes is not rather to be found in a better distribution of the radiations, in the possibility of administering the suitable dose without affecting the intervening organs, and in the more protracted action of the radiation, — all of which is possible only with the very selected beams. And — incidentally — may not that be one of the principal reasons, also, for the better results obtained from the constant and prolonged action of radioactive substances? The neoplastic cell revives easily in the intervals between successive attacks of an intermittent radiotherapy; but it dies under the constant action of a feeble radiation — against which the less sensible elements of the stroma defend themselves more easily.

Technique of Dosage and Clinical Indications

Within the very elastic limits that I have indicated in the foregoing, the roentgen rays can be applied either unfiltered or with interposition of a selective aluminium filter; aluminium being the material which best meets the requirements of the conditions here to be dealt with. By a proper regulation of the tension at the tube terminals, and by judicious choice of the right thickness of filter — ranging all the way from some tenths of a millimeter to one centimeter — one can obtain a complete range of radiations capable of producing the various local reactions and permitting, moreover, to reserve a maximum of »therapeutic» reaction for the diseased tissues and organs.

I have insisted, in the foregoing, on the technical considerations which justify and impose the employment of a »moderately deep» therapy for the treatment of skin diseases. A practice extending over more than twenty-three years proves, by the results obtained, the value of that method.

In the beginning, I used, for treatment of this order, tubes of the »residual atmosphere» type — of which the CHABAUD tube, with VILLARD's osmo-regulator, proved to be the best model. The tension used was equal to a spark of from 13 to 15 centimeters. Though this tube functioned in a most satisfactory manner, the »COOLIDGE Standard», by which I subsequently replaced it, had the advantage of being easier to regulate and of giving a more constant output. I used the latter at first with an equivalent spark of 15 cm.; but experience showed me that for superficial lesions the results were almost identical when using a spark length of up to 22 cm., the output becoming better. Anyhow, the differences in the boundary wave-

length are relatively slight; the extreme values of λ_0 being 0.154 AU. for a voltage of 80,000 (14 cm. spark), and 0.125 AU. for a voltage of 100,000 (22 cm. spark). The greater quantity of slightly penetrating rays emitted by the COOLIDGE tube at these low voltages simply necessitates — as I said a moment ago — the interposition, in certain cases, of an aluminium filter a few tenths of a millimeter in thickness; thus reducing the proportion of those very soft rays which are sometimes the means of producing a too strong erythema. If the object is to produce alterations in the deeper layers of the skin, or in the subcutaneous tissue, one must, of course, chose a more selective filter, and the voltage must be increased to the equivalent of a 25 cm. spark, and sometimes more; but this already means the first steps toward the so-called »deep» therapy. Observation and experience are the only means of aquiring the practical skill at choosing the filter and voltage proper to each individual case.

Most superficial lesions of the skin I treat either without any filter or else I use a very thin one, not more than from 0.1 to 0.3 mm. in thickness. This is the case especially with chronic eczemata, psoriasiform parakeratoses, lichenifications, seborrhoic affections, prurigo, non-suppurating prurits, flat papillomata, etc. The skin dose which I give in these cases varies from 2 to 4 H. The method of my pupil, GOUIN, which seems to be very successful in many cases of lichen planus, consist in a slightly penetrating radiation, without filter.

For ringworm of the scalp and the beard I likewise use a rather soft radiation, either non-filtered or with just the slightest filtration. I have formerly shown, together with NOIRÉ and JOUVEAU-DUBREUIL, that the epilatory dose was of 800 R. During the war, at the concentration hospital for favic diseases of the 13th region, I organised the depilation treatment by COOLIDGE tubes working with an equivalent spark of 18 cm., without having to register, from that treatment, a single accident among the several hundred favus cases dealt with.

In the multiple forms of acne that come in for radiotherapeutic treatment — and their number is truly astonishing! — I always use the same, slightly penetrating radiation; but I interpose, according to the character of the integument and the depth of the lesion, an aluminium filter from 0.5 to 1 mm. in thickness. The dose is not above 3 H.

Tuberous angioma yields more readily to a slightly penetrating radiation with feeble filtration (from 0.5 to 1 mm. Al.) than to the strong filtrations preconised by certain authors. This, moreover, is in line with the view of the radium-therapeutists, who as a matter

of fact, also use, in the first stages of the treatment, a filter of some millimeter's thickness, attached to the enamelled applicators.

I would say the same as regards true papillomata of the skin and ordinary, isolated warts. In such cases, also, a moderately deep and slightly filtered radiation will produce the desired result more rapidly than a very deep and more highly selected one.

For skin tumors of relatively slight depth, for cheloids, mycosis, lymphadenomata, etc., I do not use the deep therapy, but the technique already described, with dose and filtration varying according to the nature and depth of the lesion.

In lupus and tuberculosis of the skin, also, it is the moderately deep therapy that ought to be used by preference — with interposition of a filter more or less heavy, though never more than some millimeters — from 6 to 8 — in thickness.

In cases of bacillar adenopathy, whether open or not, I have always used a moderately deep radiation, with filtration through from 6 to 8 mm. Al. to start with, and gradually increasing the thickness of the filter, up to 1 cm. at the end of the treatment. I have obtained better results by this method than by deep therapy, and with greater safety. I have had a truly astonishing proportion of cures, and in none of my cases has there been the slightest hint of those subsequent, belated cutaneous alterations on the score of which the method has been so severely criticised.

Finally, I have no hesitation in saying that I still treat non-terebrant baso-cellular epitheliomata of the skin — when the disease has not gone beyond the skin itself — by the mixt method invented by my teacher, Brocq, and myself. After the lesion has been carefully scraped, the raw, open wound is subjected to an ordinary, moderately deep radiation, without filter, of from 10 to 15 H. The reaction is erythematous, there is no necrosis, and no caustic effect. For cases that had not been subjected to any sort of previous medical treatment whatsoever, my statistics show eighty-five per cent, of lasting and to all appearances definite cures.

On the other hand, if I cannot practice the scraping, or if there has been some previous treatment of the lesion, I prefer the deep therapy; and I advise the radiologists to use it. In such cases that is the method which will give the greater number of successes.

Besides the affections for which I believe it neccessary to use the moderately deep therapy because it is the best one, there is a whole series of others in which it gives just as good results as the deep one, provided one uses a sufficiently strong filtration. It has the advantage of not requiring a complicated outfit and of leaving room for a more critical exactness of treatment; and, finally, it is

more limited in its action, and often to be preferred from that consideration alone.

Limitations of space make it impossible for me to enumerate here all the indications for this second field of its usefulness; but all the affections calling for this use of the moderately deep therapy have one character in common: namely, the absence — or, at any rate, the very slight degree — of malignancy.

Pains, neuritis and sciatica, for instance, can be treated by using a voltage corresponding to an equivalent spark of 25 cm., with suitable filtration. I believe that my results by that method have not been inferior to the ones obtained by the operators who use a voltage corresponding to a spark length of 40 cm.; I even have the impression that mine are more constant and lasting — provided, of course, that it is not a question of conditions in which the pressure is due to some deep-seated neoformation.

In the various forms of myeloid leucemia, the irradiation of the spleen, by sectors, still belongs to the domain of moderately deep therapy. There is less risk of provoking some violent and sudden reaction; and, at all events, the full and high-dosage irradiation of a hypertrophic spleen is a fault which may result in the death of the patient.

I would say the same with respect to GRAVES' disease. Here I have recourse to deep therapy only in very exceptional cases, when all other attempts have failed. To bring about the atrophication of the too actively supersecretory elements and, at the same time, ameliorate the general symptoms, the »moderately deep» therapy is largely sufficient.

For numerous forms of osteitis, for arthritis, ostearthritis and gonococcal osteoperiostitis, for DUPUYTREN's disease, etc., I have always preferred the moderately deep therapy.

All this proves that a great many affections which are, to-day, systematically being treated by means of deep therapy, have been cured — and are being cured, right along — just as successfully by means of a less penetrating radiotherapy.

It seems to me that — in the absence of the malignancy factor — the topographical situation of the lesion, or its volume or extent, are really the only considerations that can possibly make the choice of the »deep» method imperative.

I, thus, prefer that method for the treatment of fibroma, without doubting for one moment the beautiful results that can be obtained by means of another method which I have successfully practiced for years myself.

Incidentally, the radiotherapeutists ought to make it clear to

themselves that a *deep* therapy does not necessarily mean a *massive* one, and that often it is preferable not only to scatter the dose — which ought to be the rule — but even to divide it: It is sometimes necessary to give feeble doses of deep radiation with very selective filtration.

I wish this brief exposé would make the physicians realise that besides the deep radiotherapy there exists another method — the »moderately deep» radiotherapy — the indications for which are numerous, and the results of which are brilliant.

If the older radiologists, who seem to have forgotten »the ancient therapy», would take it up again and use it in the cases for which it is indicated, I feel sure that they will aid me in drawing it forth into the light anew, from the obscurity to which it has been so jealously relegated by its younger sister-method. And, finally, I cherish the hope that the younger specialists, who do not know it, will study it, and that they will find in it a weapon, intricate to yield, sometimes, but wonderfully strong in the using.

SUMMARY

The moderately deep radiotherapy is the one which uses an equivalent spark of from 15 to 25 centimeters. The indications for its employment are very precise, and within the limits of those indications it is decidedly superior to the deep therapy. There are other affections in which its potency for curative effect is fully equal to that of the deep therapy. Finally, there is a whole series of lesions for which the moderately deep therapy, with strong filtration, is the only one indicated. Radiotherapy, consequently, comprises a whole series of methods for which the indications are different.

ZUSAMMENFASSUNG

Mässig tiefe Radiotherapie ist diejenige, die das Äquivalent eines Funkens von 15 bis 25 cm anwendet. Die Indikationen für ihren Gebrauch sind sehr präzis, und innerhalb der Grenzen dieser Indikationen ist sie der Tiefentherapie entschieden überlegen. Bei andern Affektionen wieder ist ihre kurative Leistungsfähigkeit derjenigen der Tiefentherapie völlig gleich. Schliesslich existiert eine Reihe krankhafter Veränderungen, für welche die mässig tiefe Therapie mit starker Filtration allein indiziert ist. Die Radiotheraphie umfasst also eine ganze Serie von Methoden, für welche die Indikationen verschieden sind.

RÉSUMÉ

La radiothérapie demi-profonde est celle dans laquelle on fait usage d'une étincelle équivalente de 15 à 25 centimètres. Les indications en sont très précises, et, dans les limites de ces indications, elle est manifestement supérieure à la radiothérapie profonde. L'auteur indique quelques autres affections dans lesquelles l'action curative de la radiothérapie demi-profonde équivaut entièrement à celle de la radiothérapie profonde. Il signale enfin un certain nombre de lésions dans lesquelles la radiothérapie demi-profonde, avec filtration sévère, constitute la seule méthode indiquée. La radiothérapie comprend donc un certain nombre de méthodes dont les indications sont très différentes.

ROENTGEN THERAPY IN SURGICAL TUBERCULOSIS

by

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Introductory Address at the 4th Meeting of the Northern Association for Medical Radiology in Helsingfors, September 1st and 2nd, 1925

Tuberculosis may safely be characterized as one of the foremost among the diseases where the modern light-treatment in one form or another is used. Of great value by itself, this treatment, when combined with other methods such as hygienic, dietetic and climatological measures, gives us results far above everything we earlier dared to hope for. This is true especially with regard to the so-called »surgical» tuberculosis, the treatment of which is the topic of to-day's discussion.

The experience of more than a decade has shown us that the epithet »surgical» has lost a great deal of its significance. Operative measures are nowadays abandoned or reduced to the smallest possible operations, always combined with necessary orthopedical treatment. And furthermore, we find that, while the technique improves, the indications at the same time are being extended and brought to embrace an increasing number of organs and systems of organs.

The term light-treatment is an old one. In the beginning it indicated the use of the rays of the sun-heliotherapy. But in the course of time the notion of it has become enlarged. It is a known fact that insolation is very closely connected with such conditions as climate, altitude and latitude. It therefore stands to reason that the use of this unexpensive and natural method must remain highly limeted. The idea of substituting some artificial sources of light for the real sunlight thus lies very close at hand. And we have seen this idea realised to some extent during the last ten years. In our struggle against surgical tuberculosis, we nowadays make a very extensive and admittedly successful use of the long-waved and the short-waved rays in the solarspectre, either each group separately or both combined, and also of the ultrashort X-rays farther down in the spectre.

A comparative estimate of the different kinds of artificial light is beyond the scope of this address and would meet with difficulties almost impossible to overcome. Doubtless, they all have their merits and their disadvantages; none of them is absolutely superior to the others. Administered with competence and discrimination, they give, on the whole, excellent results.

The following exposition of the importance of the X-rays and of the principles for their utilization in the treatment of surgical tuberculosis is founded on an experience extended over more than ten years and on a considerable number of cases, clinical as well as ambulant ones. With regard to the numerous statistics hitherto published, including those laid before us to-day, I am going to limit my figures considerably. Instead of that I intend to keep my impressions in view. Also, in my opinion, there are good reasons for bringing forward various conditions and considerations, which entail important consequences on the final results. To begin with it is, perhaps, suitable to explain the effect of light on the human body in general.

In this respect we are forced to admit that we know next to nothing about the real nature of the effect in question. We have to be content with a few more or less vague hypotheses. Anyhow, we generally agree that the therapeutic effect of the sunlight and its substitutes essentially constitutes a *general influence* on the whole organism and a favourable change in the tone of the constitution. On the other hand, it has been customary, in speaking of the X-rays proper, to attribute to them a direct and purely *local* effect. Lately, however, the opinion seems to be gaining ground that this obvious local effect is combined with a general one. This may perhaps be explained as due to the great power of penetration of the X-rays and their consequent absorption.

In these collateral influences of the roentgen-light we may, perhaps, seek the explanation why X-ray therapy requires comparatively so short a time. Taking into consideration the facts that the treatment of surgical tuberculosis is, as a rule, of very long duration, and that from both a practical and an economical point of view it is most desirable to reduce the time, we must admit that the X-rays certainly offer some advantages. Among these I would place the policlinical treatment foremost in any case where it is practicable. The comparatively long intervals between irradiations make it possible for quite a number of patients to take the treatment without having to discontinue their work. This is especially true with regard to the large contingent of patients suffering from tuber-

culous glands. And this greately reduces the chances of a patient's becoming so discouraged as to give up treatment.

Indications and contra-indications. In the beginning of any treatment it is necessary first to consider the patient's *general condition.* This, of course, is required also when light-treatment is to be applied. Personally, I have found it especially important when X-rays and tuberculosis are in question, because the relatively small doses are liable unexpectedly to produce general and local incidental effects. For instance, *locally* the fast disappearing swelling and tenderness constantly produced by irradiation of lymphomata, furthermore, generally the rise of temperature and the qualms always following the irradiation of a tuberculous peritonitis, be it ever so carefully administered. The *hypersensibility* of the tuberculous individual has, in my opinion, received an altogether too small consideration on the part of the radiologists. It indeed necessitates a great care in selecting the material. Every case must be judged in casu. When I find a seriously affected general state, high fever, progredient processes in the lungs etc., I always postpone the treatment until a possible improvement has taken place through the help of other measures, general or local. In very badly affected cases I nowadays positively refuse to administer irradiation. A negligence of these circumstances will certainly be punished. Already in the beginning of the treatment the radiologist will meet with disappointments, may be rather serious ones. And he will incur the risk of discrediting the therapy itself.

Beside this general hypersensibility of the individual, there is another circumstance, not less important, to be reckoned with. The X-rays having to pass through the skin in order to reach the deeper tissues, it is by no means surprising that, in spite of the comparatively small doses employed, skin lesions occur rather frequently. This fact can be explained only as due to an increased irritability. Great stress should be laid on this *hypersensibility of the integument* in the tuberculous individual. In all probability it arises from the action of toxines. It influences the dosage, to which question I shall revert later on, and above all it compels the radiologist to make a thorough inspection and examination of the prospective patient's skin and to question him carefully as to whether it has recently been in touch with chemical or physical remedies. Among the former I should especially mention iodine; among the latter the local application of warmth or of the kinds of light referred to above. In case such irritaments should have been employed, the skin must be left alone until it has recovered. In view of these circumstances and on the ground of my personal experience in these

matters I always have consistently avoided every other *local* irradiation or any treatment whatsoever during the intervals between irradiations. I have also considered it expedient to inform my patient about these contra-indications, pointing out to him the risk he runs if they are not observed.

If surgical operations are necessary, disinfection of the skin with iodine must be avoided if possible. Should iodine nevertheless have been used, the skin must immediately be washed with alcohol in order to avoid an often rather protracted dermatitis. Finally it is to be mentioned as a very interesting fact that a remarkable oversensitiveness of the skin is to be found in persons who have taken large quantities of medecines per os or by intravenous injections. Also, many writers have expressed their apprehension about causing hypersensitiveness in connection with a tuberculine reaction.

It is a fact worth attention that the great majority of those suffering from surgical tuberculosis are children and young people, for, as is well known, roentgen-sensibility is considerably increased in children. Provided that this circumstance is fairly considered, the indications of roentgen-therapy at this age are similar to those commonly acknowledged. The only limitation arises in tender infancy, brought about by the difficulty of keeping the baby immovable for a sufficiently long time.

Finally, in order to complete our subject, I want to draw your attention to the fact that the localization of the process influences the technique in a certain degree. The skin on more peripheral parts of the body, especially on the lower extremities, has proved to be more sensitive to the roentgen-light than on other parts.

This short account may perhaps convey a fair idea of the numerous circumstances the radiologist has to take into account with regard to tuberculosis. These matters are very intimately connected with the questions of the *dosage* and the *quality of the rays*.

To a certain extent, of course, the latter depends on how deep down in the tissue the tuberculous process is located. Bearing this in mind, and being guided by my personal impressions of the importance of absorption, I have rather been in the habit of avoiding the very hard rays. Also, I have rarely exceeded a spark-gap of 30 centimeters. In the case of more or less superficial processes a spark-gap of 25 centimeters has been employed. In conformity herewith the rays have been filtered through 3 mm. of Al or possibly 0.25 mm. of Cu plus 0.5 mm. of Al. In the case of higher tension, a filter of 0.5 mm. of Cu or Zn plus 1 mm. Al has been used.

As to the dosage, we first have to state that, historically speaking, it shows an irregular curve. The initially rather small doses were

later on augmented to a considerable extent, and recently the doses have again been reduced to a quantity almost below that first used. For my part, I have retained a rather conservative standpoint, i. e. I have not thought it advisable to abandon the *small* doses I have employed since 1914. The hypersensibility of the tuberculous individual is certainly a hint not to be disregarded, the more so as the experiments with strong doses have by no means given better results than the weak ones, rather the contrary. There is indeed great truth in the saying of a roentgenologist: »The weakest dose is the best dose».

My *doses* (per area) have never been larger than 50 per cent of H. E. D. through each field of entry. The average dose has been about 1/3 H. E. D. increased or decreased as individual conditions or the character of the tuberculous process seemed to require. — The question of the *intervals* between irradiations is intimately connected with the amount of the dose. Here too there is to be observed a tendency toward an increase of the time between treatments, depending upon a careful individualizing of each case and strict observance of all conditions which may have a bearing on the treatment. It has been my rule to renew the irradiations not earlier than after 4 weeks. After the 3rd series, or earlier, if reason arises, I extend the interval by 1 or 2 weeks. It is easily understood that the number of series varies greatly. Rarely is it higher than 6. Should there be cause for prolonging the treatment, the interval after the 6th series has been considerably extended, up to 2 or 3 months and more, even in cases where there are no alarming symptoms from the skin.

Later on, I shall give an account of the results obtained by my treatment of surgical tuberculosis with the careful observance of the principles laid down above. On the whole, they correspond with results published by other specialists; and they further confirm the great value of roentgen-therapy with regard to this disease. The careful dosage and the strongly individualized treatment doubtless have some bearing on the fact that no accidents, general or local, have occurred, at least not to my knowledge. There has, for instance, been no case of burning of the skin immediately subsequent to the irradiation, nor any late alterations of any great consequence.

As to the localisation of the disease the greater part of my material consists of tuberculous *lymphomata* mostly on the neck, a rather considerable number in the axilla and only a few in the mesenteric glands. The total number of cases with concluded treatment is 351. Of these 36 were 3—10 years of age, 162 were 11—20 years, 118 between 21 and 30 years, and 35 over 31 years. As completed and

cured cases I regard those in which a thorough palpation can no longer distinguish any glands, or where there remain only clumps of hard fibrous tissue, the size of a pea.

In two thirds, or 234, of the cases an after-examination has been made, from one to several years after conclusion of the treatment, the patients having put in an appearance in person or communicated by letter about their condition. In 4 per cent of those cases I have found glands just about the same as before treatment. It is doubtful whether these are to be regarded as true relapses. Such may possibly be the case if the treatment is abandoned too early. But if the diseased glands have truly been destroyed and replaced by fibrous tissue, this, of course, cannot be pronounced as recurrence of the disease proper. On the contrary, it seems clear to me that a new tuberculous infection of intact glands has taken place and the source of this must be looked for on other places, especially in the glands at the hilus. In such cases, and probably always, a roentgen-examination of the thorax must be made. Positive result gives indication for roentgen-treatment of these glands. Lately I have always taken recourse to such a measure, and I am very satisfied with the results.

The *age* of the patient has, to the best of my experience, no bearing worth mentioning on the results of the gland treatment. Of course, it has been asserted that the lymphomata in children often disappear after the employment of a few series. But this can very well be explained as due to the character of the process in the glands. The hyperplastic form, very frequent at this age, gives particularly favourable results. The fistulous glands in children, however, do not differ in this respect from glands in adults. As to older cases with glands of long duration there is no notable difference with regard to the age of the patients. The treatment is here considerably prolonged. In cases with closed abscesses, however, it is possible to reduce the time in some degree, if the pus be removed by aspiration under strong aseptic cautels, this procedure being repeated once or twice if necessary. Broken down and caseated glands should be excochleated.

With regard to the *filtering* of the rays I would draw your attention to the views I have already expressed. It is not desirable to attain an effect very deep in the tissue on account of the adjacent organs. Strong tensions, therefore, are not necessary. I would emphasize the importance of protecting the larynx, the thyroidea and also the salivary glands as much as possible. I have always tried to do this. — After-examination has given no evidence of skin alterations of serious nature. Cases treated with 3 series show almost

no appreciable skin changes at all. In instances where more than 3 series have been applied I have found a more or less distinct browncolouring of the skin. True skin changes, such as a rarefied, lustreless and dry skin, are found in 12 per cent, atrophy with teleangiectasia in 3 per cent of the cases. Ulcerations I have never perceived, nor persisting alterations of the function of the salivary glands.

My opinion of roentgen-therapy in the case of tuberculous lymphomata may be summed up as follows:

1:o. *The roentgen-therapy is comfortable for the patient, can be administered policlinically, and gives results which at least are not surpassed by other competing methods.*

2:o. *The condition of the diseased gland has in some degree an influence on the duration of treatment, but not on the final result.*

3:o. *A careful and individualized technique gives good cosmetic result and reduces local secondary alterations to a minimum.*

The roentgen-therapy has lately taken up competition with older methods on a new field, that of the *tuberculous affections of the abdominal cavity, viz. the tuberculous peritonitis. A few succesfully treated* cases from the beginning of this century have fallen in oblivion, and the old, conservative general treatment (which it must be admitted, has yielded good results) possibly combined with surgical measures, have kept the field. However, we can no longer close our eyes to the accumulated experiences from the last four or five years, and consequently, the good services that roentgen-therapy offers. Quite independently of the interesting statistics, I do not hesitate, on the ground of my own practical experiments, to pronounce this new mode of treatment a very remarkable contribution to our arsenal, and to regard the neglect of its use as a serious fault. The rapid change for the better brought about by the roentgen-method is striking indeed. The earlier permanent rise of the temperature goes down, or disappears, the general condition and the appetite ameliorate, the weight increases, the subjective and objective symptoms diminish; in one word, an often unexpected convalescence takes place. Unfortunately, this method also has its limitations; and it is of vital importance that the *indications* be considered scrupulously. Although the general condition here, as in other cases, plays an important part, it is not necessary to take it too strictly. Experience has shown, in fact, that it has been possible sometimes to save apparently quite hopeless cases with pronounced cachexia. But if, on the contrary, the patients exhibit severe complications, for instance a progredient process in the lungs or an ulcerous enteritis, I posi-

tively refuse to undertake a treatment which would only hasten the final catastrophe.

Speaking of the indications, I would draw attention to the question of the significance of the surgical treatment in these cases. It is not to be denied that a laparotomy alone can bring about a healing of the peritonitis. The conclusion would be that the value of prophylactic (postoperative) irradiation after the laparotomy would become doubtful. On the other hand, there are nowadays so many cases reported as cured by the X-rays, and others, even in my material, where the laparotomy has failed to cure, but where a roentgen-treatment, applied a long time afterwards, has proved successful. The method of selection in these cases must, to some extent, therefore, be left to the doctor's discrimination, or depend upon the patient's wishes, his pecuniary circumstances, and so forth.

The principles adopted by me at present for the treatment of tuberculous peritonitis are in short:

1:o. *Primary roentgen-treatment, independent of the type of the peritonitis* (greater quantities of ascites should be removed by punction; incision only if not avoidable, because of the danger of fistula).

2:o. *If laparotomy has been performed previously, prophylactic roentgen-treatment takes place as soon as possible.*

3:o. *Symptoms of intestinal occlusion are regarded as contra indications of roentgen-treatment. After the patient has been operated, however irradiation is resorted to.*

Easier cases can with great convenience be treated policlinically. Often this method is the only one possible with regard to outward circumstances. But at the same time it is necessary, especially in bad cases, to give the patient a general restorative, even climatological treatment.

The special technique in these cases must be chosen with regard to the above mentioned general hypersensitiveness, and by all means with careful consideration of the large area the peritoneum offers to the irradiation and the consequent absorption of the X-rays. The danger of exceeding the maximum dose lies very near at hand indeed. And this circumstance doubtless explains collateral effects, which are so very apt to occur in these cases, headache, qualms, rise of temperature, and so on. The necessity of a careful and not too large *dosage* is evident, also of a strong individualization. It is true, as HOLZKNECHT has said so strikingly: »The more severe the case, the smaller the dose.»

My cases of peritonitis have technically been treated in the following manner: Small doses, not larger than $^1/_3$ H. E. D. area-dose per field of entry, applied on the abdomen and on the back.

Filters for children 0.25 Cu plus 0.5 Al, for adults 0.5 Cu, or Zn plus 1 Al. The series is spread over several days up to 1 week, according to the reaction. It is renewed in 4 weeks at the earliest. The duration of the treatment has varied considerably, depending on the type of the cases, from 4 months to more than 1 year.

Comparatively early cases, especially in half-grown patients, have given the best prognosis. The miliary exsudative form reacts sooner and more favourable than does the plastic type. My material is decidedly too scanty for the valuation of the effect of a laparotomy on the final result.

The number of my after-examined cases is 24, and the time of observation up to 5 years for 2 patients, 4 years for 6 patients, 3 years for 3 patients, and 2 years for 4 patients. In 5 cases there was an improvement, lasting a short period, and 4 were discharged unchanged. This result, 15 cases cured out of 24, or 60 per cent, fully corresponds with the latest communications in literature on this matter, showing a percentage of from 55 to 60 of cured cases. The relatively high percentage (19) of refractory cases in my material can be explained as chiefly due to the fact that the selection of cases in the beginning was not as strict as later on. More or less permanent lesions of one kind or another have not arisen, neither have disturbances of the menstrual process occurred.

Intimately connected with tuberculous peritonitis, which very often occurs in the same patient, is *tuberculosis of the genitalia in women.* The long established method of treatment of this disease has been chiefly a restorative and surgical one, but in recent years the development of this method has entered on a new phase. The roentgen-treatment has brought about such exceedingly good results in genital tuberculosis, that most probably this method is going to become the chief weapon in our struggle against the disease in question. Excluding such cases where the surgeon, on account of large and undetachable adherences, is compelled to make only an explorative laparotomy, he cannot feel satisfactorily safe, even in operable cases where extirpation is possible, against recurrences in the glands or in peritoneum parietale.

The material at my disposition fully bears out the favourable reports from other sources. Many a time I have seen with astonishment the fast disappearance of a large tumourous resistance filling the whole cavity of the pelvis minor, the details of which could be ascertained neither by previous examination nor by laparotomy. In 3 of these cases there was a postoperative fistula, which closed up during the treatment. The general condition of the patient improved conspicuously, the weight rose by up to 10 kilos. Internal

gynaecological examination (combined manual examination) after conclusion of the treatment showed normal conditions. The four cases which are covered by this description, have enjoyed good health for 4, 3, 2 years and 1 year respectively. Amongst the other cases, 6 in number, three have been free from symptoms for 2 years, two are yet under treatment, improved, and one has disappeared.

The technique I have employed in these cases differs from the usual method in so far as I have used a heavy filter 0.5 and increased the dose of H. E. D. to 50 per cent at the most.

The indications for treatment are identical with the ones I have laid down above for tuberculous peritonitis.

So far as I know, *tuberculosis of the masculine genitals* has very rarely been subjected to roentgen-treatment. But in view of the mediocre results of an incomplete surgical operation (resection), and the mutilation (onesided or doublesided castration) brought about by a radical one, it seems to be advisable to make at least an attempt with X-rays. I can support this project by reference to the results I have obtained with roentgen-treatment of 8 cases of epididymitis, closed as well as open, the latter occurring either spontaneously or as a sequel to an operation. Every one of these cases has been cured, and so has still another one (relapse in the peripheric end of vas deferens). So far they have remained healed for a time of from 2 to 9 years. — Irradiation of Vesiculae seminales and of Prostata, usually infected in a secondary way, seems to be very plausible and fully rational.

There is still another field where the X-rays should probably be employed much more than they have hitherto been. That is the *fistulae in soft tissue* and the *nests*, stubbornly remaining after the chief nest of diseased tissue is healed up, or arisen as a sequel to a punction or an operation. I have further found irradiation of the fistula sometimes occurring in the scar after nephrectomia to be a grateful task, whether this fistula comes from a remaining part of the urethra or from infection during the operation. Good and fast healing I have also obtained by using X-rays on an infected needle canal from punction of congestive abscesses, infection of stitches after suturating, and such like.

My material of *tuberculosis in bones and joints* is much too small to permit me to form any statistics or draw any conclusions. I therefore must content myself with a relation of my personal impressions. So I can endorce the opinion that in tuberculosis of the small bones and the joints it is possible by roentgen-therapy to obtain results fully comparable with the effect of other methods. Furthermore I state that a perceptible, though less striking, change for

the better takes place in the bigger joints, that simple hydrops, especially in the kneejoint, reacts favourably to the treatment, and so do serous and funguous tendovaginitis. The effect is good, too, in the case of tuberculous spondylite and the dry omarthrite, and here we notice a conspicuous abatement of the pains as well.

A glance at the most recent literature of this department is sufficient to show that a very intense work is going on, and that the roentgen-treatment of the tuberculous diseases in bones and joints will soon be of equal value to any of the earlier methods. We have seen statistics with a percentage of cures up to 60 and 70. The cause of this success is to be found, it seems to me, partly in the nature of the rays (deep penetration), partly in the possibility of employing, in many cases and in many localisations an inexpensive and comfortable policlinical treatment. It is hardly necessary to point out that the patient's general state and condition in these cases must also be considered in the greatest possible degree.

SUMMARY

The writer gives an account of the experiments he has made and the results he has obtained in the roentgen treatment of surgical tuberculosis. He for his part considers that as a method of treatment it has, roughly speaking, the same value as the other method now in use, provided that the common precautions are not neglected. In many cases, moreover, it possesses the advantage that it can be employed policlinically — which is a substantial advantage from the standpoint of social economics. — With regard to doses the writer considers that small ones are the best, about one-third H. E. D., with an upward allowance of 20 %, or at most 50 %.

A considerable part of the material consists of *tuberculous lymphomata*, with after-control in 234 cases. Difference in stage exercises but little influence on the result, but the period of treatment is prolonged by the spreading and fistulous forms. Filter 3 Al or possibly 0.25 Cu. Careful precontrol of the skin. No local irritations allowed throughout the whole period of treatment. *Relapses*, or possibly newly developed glands, in 4 %. Non-dangerous *skin changes* in 12 %; atrophy and teleangiectasy in 3 %. No necrosis.

The treatment of tuberculous peritonitis has proved extremely effective in the cases where there have been no complications in the lungs or intestines. Out of 24 cases 15 were cured, with an observation-period of 2—5 years; transient improvements in 5 cases, 4 cases not cured.

Tuberculosis of the female genital organs reacts extremely well, and here the writer sees the best remedy at present in roentgen irradiation. Out of 10 cases 4 (hopeless when the treatment started) are well; 3 have been free of symptoms for two years; 2 are still under treatment (improved); and 1 has disappeared. Cases operated ought to be radiated afterwards.

In tuberculosis of the male genital organs too little attention is paid to roentgen-therapy. Here the writer's 9 cases (8 of epididymitis and 1 of deferens-relapse) have all been restored to health.

Cases of fistulae after nephrectomy, tuberculously infected puncture canals, and generally secondary affected nests of disease in soft tissues give a good prognosis. *In tuberculosis of the bones and joints* also the roentgen treatment is gaining a good position.

ZUSAMMENFASSUNG

Verf. berichtet über die Erfahrungen, die er bei der Röntgenbehandlung chirurgischer Tuberkulosen gemacht, und über die Resultate, die er dabei erreicht hat. Seiner Ansicht nach besitzt diese Methode nun als Behandlung im grossen ganzen denselben Wert wie die anderen jetzt in Verwendung stehenden, vorausgesetzt, dass die allgemeinen Massnahmen nicht verabsäumt werden. Darüber hinaus besitzt sie in einer Menge von Fällen den Vorzug, dass sie ambulatorisch durchgeführt werden kann, ein beachtenswerter Vorteil in sozial-ökonomischer Beziehung. — Betreffs der Technik ist Verf. der Meinung, dass die kleinen Dosen am besten wirken, ungefähr $^1/_3$ H. E. D. mit Variationen bis 20 %, aufwärts bis höchstens $^1/_2$ H. E. D.

Ein bedeutender Teil des Materials besteht aus *tuberkulösen Lymphomen*, davon 234 Fälle mit Nachkontrolle. Von geringem Einfluss auf das Resultat ist es, in welchem Stadium sich die Affektion befindet. Bei den zerfallenden und fistulösen Formen wird die Behandlungszeit länger. Filter: 3 Al, event. 0.25 Cu. Genaue Vorkontrolle der Haut. Lokale Reize sind während der ganzen Behandlung nicht zulässig. Zu *Rezidiven* event. neuentstandenen Drüsenschwellungen kam es in 4 %, zu ungefährlichen Hautveränderungen in 12 %, Atrophie und Teleangiektasie in 3 %. Keine Nekrose.

Die Behandlung der *tuberkulösen Peritonitis* hat sich in Fällen, wo keine Lungen- resp. Darmkomplikationen vorlagen, als sehr wirkungsvoll erwiesen. Von 24 Fällen waren 15 in einer Beobachtungszeit von zwei bis fünf Jahren geheilt geblieben; in 5 Fällen kurzdauernde Besserung, 4 nicht geheilt.

Ausserordentlich gut reagiert die *weibliche Genitaltuberkulose*, und Verf. sieht in der Röntgenbestrahlung derzeit das beste Mittel gegen diese Affektionen. Von 10 Fällen sind 4 (bei Einleitung der Behandlung hoffnungslose) Fälle gesund, 3 seit 2 Jahren symptomfrei, 2 noch in Behandlung (gebessert) und 1 unbekannten Aufenthaltes. — Operierte Fälle müssen nachbestrahlt werden.

Zu wenig beachtet ist die Röntgentherapie bei der *männlichen Genitaltuberkulose*. Die 9 Fälle im Material des Verfassers (8 Epididymitiden und ein V.-deferens-Rezidiv) gelangten alle zur Heilung.

Fälle von Fisteln nach Nephrektomie, tuberkulös infizierte Punktionskanäle, überhaupt sekundär eingeimpfte Weichteilsherde geben eine gute Prognose. — Auch bei *Knochen- und Gelenktuberkulose* ist die Röntgenbehandlung im Begriffe sich eine dauernde Stellung zu erobern.

RÉSUMÉ

L'auteur rend compte des expérience u'il a faites et des résultats qu'il a obtenus dans le traitement roentgenologique de la tuberculose chirurgicale. Il estime que cette méthode présente, à tout prendre, la même valeur que les

autres méthodes thérapeutiques actuellement appliquées, à condition qu'on ne néglige pas le traitement général. Elle présente en outre l'avantage de pouvoir être appliquée sous la forme ambulatoire, ce qui est d'importance au point de vue de l'économie sociale. En ce qui concerne la technique, l'auteur donne la préférence aux doses faibles, 1/3 H. E. D. environ avec latitude inférieure de 20 % et supérieure d'au plus 50 %.

Une part importante du matériel clinique est fourni par des *lymphomes tuberculeux*, avec contrôle ultérieur dans 234 cas. Les divers stades n'ont que peu d'influence sur le résultat; la durée du traitement est plus longue dans les formes serpigineuses et fistuleuses. Filtre 3 Al, éventuellement 0.25 Cu. Contrôle préalable rigoureux de la peau. Interdiction, pendant le traitement de tout irritant local. *Récidive* par nouveaux ganglions dans 4 % des cas. *Modifications anodines de la peau* dans 12 %, *atrophie et téléangiectasie* dans 3 % des cas. Pas de nécrose.

Le traitement de la *péritonite tuberculeuse* s'est montré particulièrement actif dans des cas où il n'existait simultanément aucune complication pulmonaire ou intestinale. Sur 24 cas, 15 guérisons, avec période d'observation de deux à cinq ans; dans 5 cas, amélioration passagère, 4 insuccès.

La tuberculose génitale de la femme réagit d'une façon très satisfaisante, et l'auteur considère, dans ces cas, la roentgenothérapie comme la méthode de choix. Sur 10 cas 4 (paraissant au début du traitement tout à fait désespérés) sont en très bonne santé, 3 exempts de tous symptômes depuis deux ans, 2 encore en traitement (amélioration) et un disparu. Les cas opérés doivent être irradiés après l'opération.

La roentgenothérapie est trop peu connue comme méthode thérapeutique dans *la tuberculose génitale de l'homme*. L'auteur a observé 9 cas (8 épididymites et une récidive du canal déférent) tous entièrement guéris

Les cas de fistules après néphrectomie, d'orifices de ponctions atteints d'infection tuberculeuse, et d'une façon générale tous les foyers secondaires des parties molles donnent un très bon pronostic. La roentgenothérapie est en train de conquérir une place appréciable même dans la tuberculose osseuse ou articulaire.

THE EFFICACY OF VARIOUS SOURCES OF LIGHT IN GENERAL LIGHT-BATH TREATMENT

by

Axel Reyn

Introductory Address at the 4th Meeting of the Northern Association for Medical Radiology in Helsingfors, September 1st and 2nd, 1925

Before entering on the main subject of this discourse, I would like, with your permission, to make a few purely historical remarks on the utilisation of light as a curative agent.

It was FINSEN, as you all know, who was the founder of the modern light-therapy. It is true that long before his time, and even as far back as in the days of antiquity, people had used sun-baths for curative purposes; chiefly, no doubt, because in the light they saw the originating principle of all life. But of the *manner* in which the sun acted they had no conception whatsoever. Now, in the course of time, these sun-baths came to be used for a great many affections, chiefly on account of the heating effect produced; still, at the same time, there was an idea that the sun had a curative and cleansing influence. Thus, about the year 1000 of our present era, an Arabian physician declared that those who expose themselves to the rays of the sun, and to the fresh air, protect themselves against disease. Also during the great epidemics of pestilence, towards the end of the fourteenth century, the sunlight was, in some places, brought into play as a hygienic measure; as, for instance, when, in 1377, the magistrates of Ragusa issued an ordinance commanding that all and any persons coming from a place where the plague was known to be raging, should be held in quarantine for a period of one month, during which time they were daily to be exposed to the sun and the wind, in order that they might become purified.

The faith in the health-giving action of the sun persisted through the ages; stoutly proclaimed by some, decried by others. It was chiefly the heat-effect that was believed in, however. I shall not

dwell any further on this matter, except to refer those interested in the subject to the volume, by BERNHARDT: "Sonnenlichtbehandlung in der Chirurgie". There is only one extremely interesting fact which I would like to mention, namely, that in 1845 BONNET, of Lyon, recommended the use of sun-baths for chronic affections in the joints; and that this idea was kept up in Lyon, where OLLIER, and specially PONCET, used the practice of letting their patients suffering from tuberculous affections lie out in the sun on open verandas; but there was no attempt at any scientific argumentation for this treatment; nor was it in any way kept up systematically. It was only after FINSEN had made his experiments, and on the basis of these, that the general photo-treatment was taken up and made an integrant link in the fight against tuberculosis; and it was FINSEN who first, on the basis of a series of investigations concerning the action of light on the human organism, suggested the use of the general light-treatment as a therapeutical method.

FINSEN based his suggestions on the chemical rays in the light. A distinction between heat-effect and light-effect had been made as far back as in 1816, when DOEBEREINER pointed out the difference between taking sun-bath dressed in colored clothes, which results in a transpiration bath, and letting the sun shine directly on the skin, when one gets a light bath. But of any active *chemical* effect from the light DOEBEREINER had no idea. It was not until much later that the question concerning the action of the chemical rays came up. Thus, as regards the bacteria, it was shown, in 1877, by DOWNES and BLUNT, that the more refrangible rays are the ones that have the strongest bactericidal effect; and WIDMARK was the first who definitely proved that it is the refrangible chemical rays that produce sunburn. But it was FINSEN who first proposed to utilise these qualities of the light for therapeutical purposes. He began his investigations with the sunlight; but he soon abandoned this for the use of artificial sources of light, because in these northern lowlands the sun is a very unreliable factor; and he chose the carbon-arc light instead.

The experimentation of FINSEN aimed, in the first place, at confirming the results of investigations previously undertaken, but he also wished to carry these investigations farther, and to widen their scope. They led him, first of all, to the treatment of skin diseases by means of concentrated chemical light; but already before he began to experiment with this kind of treatment, he had made a number of other investigations, which led him to suggest treatment by general irradiation. In this connection, he showed that the light-erythema, which is followed by pigmentation, persists long after the

irradiation has been discontinued; and he perceived in this a fact of the very greatest importance, because — as he pointed out — the protracted distension of the capillaries of the skin, which occurs as a result of the latter being strongly acted on by the light, must be of consequence in at least two directions. In the first place, the skin becomes better nourished and more vigorous, with the result that its functions are stimulated; in the second place, the distension of the capillaries must be of moment with respect to the inner organs, and especially to the heart, because the distribution of the blood becomes a different one. He also noticed that light has an inciting effect on the organism. Larves of the salamander, for instance, and the fetus of the frog, showed much more frequent movements when exposed to the action of chemical light. If they were kept in the dark, or irradiated with chemically inactive, red light, their movements ceased. FINSEN further showed that the shorter the length of the light waves, the greater became the inciting effect of the light; and that the chemical light left an after-effect, which showed itself in the fact that the movements continued for some time after the irradiation had ceased.

FINSEN believed that these various biological effects of the light might be made use of, therapeutically, for a general treatment in the form of light baths, using either the sun or some artificial source of light rich in chemical rays. He did not, however, get his ideas concerning this therapy carried into practice at the time — this was in 1895 — because he was occupied in improving and perfecting his method for treatment with concentrated chemical light, and he died before he could get the general light-bath treatment systematised. But he left at his death the complete designs for a clinic in which investigations were to be undertaken for the purpose of ascertaining more exactly what affections would lend themselves to treatment by general light baths; and among the diseases in which this treatment was to be used, he expressly mentions tuberculosis.

A number of the investigations which FINSEN and his pupils undertook with a view to improving the treatment with concentrated chemical light, have an important bearing, also, on the technique of the light baths, and on the sources of light which can (and should) be made use of for general light treatment. It is therefore necessary to mention them briefly here.

As you all know, the concentrated light-treatment is based on the power of the chemical rays to kill bacteria and to produce inflammation in the skin. FINSEN showed that all the chemical rays possess this power, but that it becomes greater as the light-waves get shorter, and he therefore ended by using only carbon-arc light

gathered through rock-crystal lenses. He did this because the carbon-arc light, provided one has chosen the proper lamps and has seen to it that there is the proper proportion between the amperage, the tension, and the diameter of the carbon, contains a far greater amount of ultraviolet rays than the sun of a lowland country; and as it turned out, also, the results of the local light-treatment became enormously better as a consequence of this modified technique.

The realisation of these facts led to special efforts being made to obtain sources of light containing as many short-wave rays as possible; and as the "Finsen Equipment" is comparatively expensive both as regards original cost and running expenses, several lamps were constructed which gave many short-wave rays for a relatively low amperage. The most important of these were KROMAYER's mercury-quartz lamp and BANG's iron lamp.

It soon turned out, however, that although these new lamps were strongly bactericidal and could produce even violent inflammation of the skin, they were nevertheless vastly inferior to the concentrated carbon-arc light of FINSEN.

At a first glance, this might appear strange; but the reason became evident when the spectra of these various light-givers were investigated and the penetrating power of their chemical rays measured.

JANSEN, for instance, made a series of investigations concerning the power of the chemical rays to penetrate the living tissue, which showed that this penetrating power became very much less with decreasing length of the waves, and that rays with a wave length of less than 300 $\mu\mu$ were retained by the very uppermost layers of the epidermis. The inflammation produced by the short-wave rays is, consequently, entirely superficial, and does not have any influence on affections more deep-seated in the skin.

If, now, we examine the spectra of the three sources of light just mentioned, we find that the spectrum of the carbon-arc light is a continuous one, and rich in all kinds of chemical rays; while the spectra of the mercury light and the iron light are line spectra; that is, they contain certain qualities of rays but lack the intervening ones entirely, and those which are present are chiefly rays that have a wave-length of less than 300 $\mu\mu$. It was therefore only natural that these sources of light should fail to have any effect on such relatively deep-seated skin affections as, for instance, lupus vulgaris.

GUNNI BUSCK, pursuing the study of this problem still further, showed (Dermatol. Zeitschrift, vol. II) that when the light from an iron lamp, even with a current of as much as 15 ampères, was

made to pass through a thin layer of very feeble methylene-blue solution, there was not the slightest effect to be noticed on the bacteria after 5 minutes' irradiation, while, under exactly similar conditions, the concentrated carbon-arc light killed them in less than 1 second. He further showed that while the concentrated carbon-arc light, passing through the exsanguinated ear of a rabbit, darkened a piece of photographic paper in 1 second, a similar darkening of the paper required, by the light of BANG's iron lamp (8 amp., 35 volt), $1^1/_4$ minute. Through, respectively, 2, 3 and 4 rabbit's ears, the carbon-arc light blackened the paper in, respectively, 6 seconds, 23 seconds and $2^1/_2$ minutes; while, through 2 rabbit's ears, the iron light did not produce any darkening, even after 5 minutes' irradiation.

Similar experiments with the mercury lamp gave exactly the same result; namely, that the mercury light, even though its penetrating power is *somewhat* greater than that of the iron light, is nevertheless very much inferior to the carbon-arc light in this respect.

A great many other investigations have, of course, been made concerning the effects of light on the human organism, but they are of no interest in this connection; and what here has been set forth may be said to describe fairly exactly the extent of our knowledge respecting the therapeutically important biological effects of light at the moment when FINSEN died before the opportunity had been given him to methodise the general light treatment.

Then, in 1902, BERNHARDT began to treat surgical tuberculosis by means of sun-baths, inspired to this, as he says, by the various investigations of FINSEN. Not very long after, the treatment was taken up by ROLLIER, and during the following years there appeared, from the pens of these two scientists, various reports describing the good results which they had obtained from sun-treatment of surgical tuberculosis, in high mountain altitudes.

The treatment of these affections with artificial light baths was not begun until much later. As far as I have been able to find out, VULPIUS is the first who speaks of having treated some cases of surgical tuberculosis by means of "artificial mountain sun"; then, in 1913, came my own first reports of my first results with carbon-arc light; and a little later in the same year, HEYERDAHL, of Oslo, mentioned, in a foot-note in the "Hygæa", that he had already for some time been trying the carbon-arc light in cases of surgical tuberculosis without publishing anything about the matter.

After the solar treatment of tuberculosis had been inaugurated, it was, of course, attempted to account for the effect of the light,

in this disease, partly on the basis of the investigations already made, and partly through a series of new and important experiments undertaken in all parts of the world. A solution of this question would, namely, be of the greatest importance, not only as a matter of guidance for the treatment itself, but also on account of the enormous aid it would be in choosing the proper sources of light to be utilised, if it was known precisely *what* processes in the organism had to be activated in order to bring about a cure, and *what* qualities of rays, precisely, played a rôle in those healing processes.

Up to now, this problem has not been solved, unfortunately; and I shall not enter into any details on the subject of these investigations, except to say that for a long while great importance was attached to the pigmentation, though no doubt erroneously. At least, neither I nor several others — like VULPIUS, for instance — have ever, in spite of the most careful study of the matter, been able to notice any difference, as regards the healing, between patients who pigmented easily, and those in whom the irradiation produced pigmentation only with difficulty or hardly at all. It is also noticeable that, of recent years, this theory of the pigmentation and its importance is losing ground, more and more, even in the eyes of those who were once its most ardent defenders.

While, thus, the experimental investigations have not brought any solution of these problems, a useful guidance for the selection of the most suitable source of light is furnished, in one way and another, by the clinical results obtained; at the same time as these results confirm the opinion of FINSEN, namely, that in general light-bath treatment it is the chemical rays that are the most important.

In order to demonstrate this more clearly, it will be necessary to speak a little more in detail of the solar spectrum and of the relation of the rays of the sun to the atmosphere.

The solar spectrum is a continuous one, and both in the mountains and in the lowlands it contains all qualities of rays, from ultra-red to ultra-violet of about 290 $\mu\mu$ wave-length; but both the quality and the quantity of the rays varies with the seasons. In high altitudes, the sunlight contains greater quantities of all the rays than in the plains, because in the plains the atmosphere absorbs a proportion of all the rays; and this absorption is greater the shorter the length of the waves; that is: the absorption is greatest for the chemical rays, and especially for the short-waved chemical rays.

The conditions of atmospheric absorption have been the subject of a long series of excellent investigations, notably by LANGLEY and DORNO (Strahlentherapie, vols. IX and X). To dwell on these would carry us too far; this much should be remembered, however: that

the absorption increases with the increasing density of the atmosphere; that is, it becomes stronger the nearer we get to sea-level and the more obliquely the rays of the sun are falling; and, at the same time, the absorption increases the more moisture and dust the atmosphere contains.

If, now, we look a little more closely at the manner in which the energy is distributed in the solar spectrum, we find that there are relatively few rays that have a wave-length of less than 300 $\mu\mu$. It is only at about 313 $\mu\mu$ that the amount of energy increases considerably, and it is greatest for those qualities of rays that have a wave-length of from 400 to 500 $\mu\mu$. Now, inasmuch as the absorption of the atmosphere is strongest for the short-wave ultra-violet rays, this means that at the sea-level the sunlight contains a relatively large quantity of blue and violet rays, as well as of rays that give light and heat; while, in comparison with the sun of the high altitudes, it is relatively poor in ultra-violet rays, and especially in those ultra-violet rays the length of whose waves is less than 313 $\mu\mu$. According to ELSTER and GEITEL, the proportion, in contents of ultra-violet rays of all wave-lengths, is, at the altitudes of, respectively, 80, 1,600 and 3,100 meters above sea-level, as 40 to 61 to 90; and inasmuch as, as already mentioned, it is particularly the more short-waved rays that are absorbed, this is as much as to say that it is chiefly rays with a wave-length of more than 313 $\mu\mu$ that are found at sea-level.

The conditions here described refer to the direct sunlight, but not to what is called the »sky-radiation». Of the latter we know that it is very considerable in high altitudes, and that, there, it contains a great deal of ultra-violet light. In the lowlands it has not been examined, but there the conditions described as obtaining in the matter of direct sunlight apply almost equally to the sky-radiation.

What conclusions, then, can we draw from the facts we have just been considering? — We know that the treatment of surgical tuberculosis has given excellent results both in high altitudes and down by the sea. A few writers, such as RICHARD and FELICITAS FELTEN (Strahlentherapie, vol. I), think that the results have been better by the sea than in the mountains; while all agree that inland in the plain they are considerably poorer. We know that the sun of the high altitudes is rich in all qualities of rays; that in the lowlands it contains many heat rays and relatively many blue and violet rays, while it is less rich in ultra-violet, and especially in the ultra-violet rays of short wave-length. From this we must conclude that it is the more long-waved ultra-violet, together with the violet and blue rays, that are of principal importance; for these are found in great

quantities in the light of the high altitudes, just as they are found in great quantities by the sea, where the surface of the water, and probably also the white sand, reflect great quantities of these rays, thereby increasing the chemical force of the light considerably; while in the inland plains, where there is no reflexion corresponding with that of the sea, there is nothing to increase the chemical power of the light.

That the short-wave ultra-violet rays play a relatively insignificant rôle, accords with the opinion advanced by a few writers (see: SCHANZ, in Strahlentherapie, vols. VIII and IX) to the effect that in high altitudes the cure of surgical tuberculosis is effected more rapidly in winter than in summer, and this in spite of the fact that, as DORNO has observed, the winter sun in Davos contains relatively few ultra-violet rays, and no rays of a wave-length shorter than 313 $\mu\mu$.

This opinion also agrees very well with what we know in regard to the penetrating qualities of the rays in live tissues, of which we have seen that rays of less than 313 $\mu\mu$ wave-length are arrested already in the uppermost layers of the epidermis, while the more long-waved ultra-violet, the violet and the blue rays have a relatively strong power of penetration.

Of recent years, the question of the luminous heat rays has been taken up by a number of writers, and many of these, like, for instance, BERNHARDT, DORNO, ROLLIER, SCHANZ, and several others, believe them to play a not unimportant rôle, partly owing to their power of penetrating deeply into the tissues, and partly because certain circumstances would seem to indicate that they heighten the effect of the chemical rays in the organism. While this is, of course, a mere hypothesis, another fact about the luminous heat rays has been positively demonstrated by SONNE; namely, that they are capable of destroying toxins in the blood circulating in the organism, on account of the heating which this blood undergoes during irradiation. This would seem to indicate that these rays are of real value in connection with the light-bath therapy.

If, now, we try to sum up all that has been said in the foregoing, we must come to the conclusion that although we know the chemical rays, and especially those that have the longer waves, to be indispensable, it is by no means given that all the rest of the rays in the spectrum are of no importance; on the contrary, a great many circumstances seem to indicate that they, too, play a certain rôle.

That neither the pigmentation nor the short-wave ultra-violet rays are the factors of final importance for the healing in several forms of tuberculosis seems to me to be confirmed by the results of some investigations which HAUSSER and VAHLE have made concerning

the pigmenting effect of the different rays (Strahlentherapie, vol. XIII).

These two investigators tried to find out which of the spectral rays had the strongest effect for producing erythema and pigmentation, and they believe that they have ascertained this to be the case of the ultra-violet rays with wave-lengths of from 297 to 302 $\mu\mu$. These rays are present in considerable quantities in the mercury quartz light; more abundantly so, in fact, than in the solar spectrum. According to DORNO (Strahlentherapie, vol. XIV) the quantity of ultra-violet light emitted by a mercury lamp at a distance of 100 cm. equals the quantity of ultra-violet light from the sun and the sky-radiation together at Davos. With closer approach to the lamp, the intensity of the ultra-violet light from the latter becomes considerably greater than that from the sun. On the other hand, the intensity of the long-wave rays is considerably less; for instance (at 100 cm.): green-blue, 16,8 per cent. of the corresponding color in the solar spectrum; blue, 19,0 per cent.; blue-violet, 25,8; and blue-ultra-violet, 45,9 per cent. The heat intensity is only 6 per cent.

If, now, it were these short-wave ultra-violet rays on which the issue depended, the results should be much better with »artificial mountain sun» than with natural sunlight; but we all know it for a generally acknowledged fact that it is the very contrary that is the case, even very much so. Furthermore, the results obtained in high altitudes during winter should be very poor, seeing that during that season the sun contains relatively few ultra-violet rays, and especially none at all with a wave length of less than 313 $\mu\mu$; but I have just quoted some writers who hold that, on the contrary, it is in winter that the effect is best in the mountains. These experimental investigations, thus, confirm very strongly the theory according to which it is not the short-wave ultra-violet rays but, on the contrary, the more deeply penetrating chemical rays of greater wave length that are the determining factor, just because the action of these rays displays itself in the somewhat deeper layers of the skin. It is true that HAUSSER and VAHLE point out that only rays with a wave-length of less than 320 $\mu\mu$ have the effect of producing erythema and pigmentation, and also that ROLLIER will ascribe this action only to the ultra-violet rays; and in the opinion of all these three writers the rays having this effect are the only ones (apart from the heat rays) that play any considerable rôle in connection with the light-bath treatment. This, however, is not a theory which can be adopted outright; simply because, as I have already pointed out, we know so very little, after all, of the reasons *why* light has so curative an

effect in tuberculosis; and to this it must be added, furthermore, that it is not correct to say that only the ultra-violet rays produce light-erythema. Thus, I have myself on the arms of three different individuals produced a distinct erythema by irradiation for 1 to 2 hours, with concentrated carbon-arc light (50 ampères, 55 volt) filtered through an acid solution of quinine sulphate, which absorbs all the ultra-violet rays and some of the visible ones. And with sunlight, gathered through a glass-apparatus of which the quinine solution formed the lens, I have obtained erythema and pigmentation after 30 minutes. The erythema was a typical light-erythema, occurring several hours after irradiation.

This proves that a light-erythema can be produced even though the light contains no ultra-violet rays at all; and it shows — for we all know the sunlight to contain far more blue-violet rays than the carbon-arc light — that the erythema is produced all the more quickly the greater the quantity of these blue-violet rays is in the irradiating medium. That this fact has not been perceived by the writers just mentioned is because they have worked with a too low intensity of irradiation; and that so long exposures are required, is due to the fact that the blue-violet rays penetrate far better than the ultra-violet ones; for, as we all know, the biological effect depends on the quantity of light absorbed. This, consequently, means that the blue and violet rays are the ones which produce the greatest effect in the deeper, blood-carrying layers of the skin; and this, in connection with the other conditions relating to the results of the solar treatment, is undoubtedly a factor of the very greatest importance.

From what here has been said, it becomes apparent that in choosing a source of irradiation we should aim at getting as many blue, violet and ultra-violet rays of great wave length as possible, and also red luminous rays, the importance of which must not be underestimated. In other words, we should as far as possible use sources of light having a continuous spectrum.

In all that I have been saying in the foregoing, I have been taking it for granted that light is the most important agent for cure in the various forms of surgical tuberculosis; a fact which I consider to be proved by the results obtained by the late Dr ERNST and myself at the Finsen Institute, where — although both mountains and the air of the sea were wanting — a truly gratifying measure of success has attended our work with the carbon-arc light. Of course, I do not wish to infer that the two factors alluded to are without importance; on the contrary, sanatoria and hospitals for patients with surgical tuberculosis ought always, as far as possible, to be placed

either in the mountains or by the seashore, in order that the greatest possible use may be made of the enormous influence which the climate of those situations undoubtedly has in the matter of bringing about a cure. —

After these more general remarks, let us now consider the various sources of light, beginning with the one which is both the cheapest and the best; namely,

The Sunlight

The sunlight contains all the various qualities of rays, except the ultra-violet ones of very short wave-length. But, as we have already seen, these rays play no rôle, and are even, by some writers, considered as harmful. The sunlight can be utilised in all places where its chemical force is not in any noticeable degree weakened by the atmosphere; and everywhere, except in such places, it contains quantities of light far exceeding those of any artificial source. In high altitudes the sun can therefore be utilised as a source of light all the year round, and the same is, in the southern countries, the case also down in the plains, by the seashore. But as soon as we get higher north, up into central and northern Europe, the parts of the year and the hours of the day during which the sun can be utilised is, in the lowland countries, considerably more limited. I do not know how conditions are, in this respect, in the alps of Norway; it is a question which, as far as I have been able to find out, has not yet been made the subject of any investigation; but in view of its importance it is to be hoped that it will be taken up, by and by, as the interest in general light-bath treatment becomes more universal. I shall therefore confine myself to speaking of the manner in which sun-baths are made use of in the plain-countries of the North.

We have seen in the foregoing that all investigations regarding the solar treatment go to show that in the lowlands this form of therapy gives by far the best results by the seashore because, there, the chemical force of the sun is so largely supplemented by reflexion from the surface of the sea. There can be no doubt, therefore, but that in these northern countries the sanatoria for surgical tuberculosis ought, as far as possible, to be located somewhere along the extensive and easily accessible coast-lines.

The next two questions that arise are, then, in the first place:

Whether the location of the sanatorium is otherwise a matter of indifference, as long as it is on the coast?

and, in the second place:

During what seasons of the year, and during what hours of the day, can the sun be utilised?

As regards the first of these questions, let me say, right at the outset, that the choice of the exact location for the sanatorium is by no means an indifferent matter.

The first requirement to be considered is that it should be a place where there are many days of sunshine, and that it should be as remote as possible from urban agglomerations, especially from smoky factory towns, in order that the air may be in the highest possible degree free from dust, because the latter absorbs the chemical rays. In the second place, a situation should be chosen where the atmosphere is as dry and clear as possible; therefore there should be no woods in the immediate neighbourhood. The coast must be flat and sandy, in order that the patients may have easy access to sea-bathing; and preferably it should be backed by hills on its northern side, against the chilly winds, so that the sun-baths can be taken even when the days are slightly cold. The sanatorium itself should be situated close by the shore, in order that patients who cannot be brought down to the water's edge may nevertheless profit by the reflexion from the sea when taking their sun-baths on the balconies, which should face south. All these are points which must be taken into consideration in the selection of a location for the sanatorium, as was done, for instance, in the case of Sir HENRY GAUVAIN's coast-hospital, when the whole south-coast of England was looked over, with just these conditions in mind, before the situation at Hayling Island was finally decided on.

Studies of this kind have not, to my knowledge, been made in the Scandinavian countries; but they certainly ought to be made an indispensable preliminary to the choice of the situation for any coast-hospital to be built in the future. —

To the second question: as to the seasons of the year and the hours of the day during which the sun can be utilised, we must answer *that the sun can be used only when it contains abundant quantities of chemical light.*

For Denmark, there exists a series of investigations, by ABSALON LARSEN (Meddelelser fra Finsen's medicinske Lysinstitut, I), concerning the chemical intensity of the direct rays of the sun during the different months of the year and at the different hours of day; and if we look at the table showing the results of those investigations, we see that in Denmark it is only during the months from April to October, both these included, that the sun contains any considerable quantities of chemical light.

The chemical intensity of the direct rays of the sun, at Copenhagen

Hour A. M. / P. M.	12	11 / 1	10 / 2	9 / 3	8 / 4	7 / 5	6 / 6	5 / 7	4 / 8
Dec. 21	4.5	2.5	1.7	0.4	—	—	—	—	—
Jan. 20	12.7	9.9	2.8	1.4	0	—	—	—	—
Feb. 19	38.7	34.9	23.6	10.3	1.7	0	—	—	—
Mch. 21	72.3	68.4	58.3	39.3	18.3	2.1	0	—	—
Apr. 21	100.6	97.6	87.9	71.9	49.6	23.1	2.6	0.3	—
May 21	114.6	112.1	104.0	89.8	49.9	44.7	18.7	2.2	0.2
June 21	118.8	116.5	109.0	95.8	76.7	52.6	25.7	5.3	1.0
July 21	114.6	112.1	104.0	89.8	69.9	44.7	18.7	2.2	0.2
Aug. 21	100.6	97.6	87.9	71.9	49.6	23.1	2.6	0.3	—
Sep. 22	72.3	68.4	58.3	39.3	18.2	2.1	0	—	—
Oct. 22	38.7	34.9	23.6	10.3	1.7	0	—	—	—
Nov. 21	12.7	9.9	2.8	1.4	0	—	—	—	—
Dec. 21	4.5	2.5	1.7	0.4	—	—	—	—	—

The reason of this is that only during these months does the sun get sufficiently high toward the zenith, and, as I have already pointed out, the absorption of sunlight by the atmosphere increases very considerably with the distance for which the light has to pass through the denser layers of the latter. The climate also sets a limit to the utilisation of the sun, of course; and in the winter-time the weather is generally too cold and rough to permit of the patients being out of doors naked. In April, it is often very difficult to give sun-baths for this reason; and to screen the patients by having them lie behind glass windows is impracticable because ordinary window glass absorbs by far too great a portion of the chemical rays.

As regards the chemical intensity of the light at various hours, this intensity is, of course, greatest at noon, when the rays fall perpendiculary and their way through the atmosphere is shortest. The sun-bath should therefore be given about noon and during the hours immediately before and after. The conditions in this regard will be seen from the preceding table.

The number of clear days is, of course, an element of great importance, and the number of these days is greatest during the warm season, as may be seen from the following table (likewise from the work of Mr. LARSEN) which shows the number of hours of sunshine, in Copenhagen:

Month:	Sun above the Horizon, Number of hours per day:	Average number of sunshine hours per day:			Greatest number of sunshine hours in 1 day:		
		1896	1897	1898	1896	1897	1898
January	7 hours 40 min.	0.7	0.3	0.2	5.7	4.1	2.7
February	9 » 28 »	1.6	2.3	0.9	7.4	7.6	6.1
March	11 » 30 »	1.4	1.3	1.7	6.4	8.1	8.8
April	14 » 18 »	3.3	4.3	—	11.4	10.4	—
May	16 » 12 »	6.0	5.7	—	12.0	13.2	—
June	17 » 19 »	7.7	5.5	5.6	12.0	11.8	12.8
July	16 » 40 »	4.6	3.6	5.3	11.2	11.8	14.3
August	15 » 0 »	4.4	3.7	5.0	10.3	10.9	12.1
September	12 » 40 »	4.1	4.1	4.8	9.7	10.1	10.2
October	10 » 18 »	1.6	1.8	2.1	6.0	8.4	8.6
November	8 » 20 »	1.0	1.2	—	7.2	6.9	—
December	7 » 3 »	0.7	0.3	—	5.4	3.9	—

Unfortunately, I have not been able to find out at what time of day the number of sunshine hours is greatest; a question which is by no means unimportant, seeing that the intensity of the light depends in a great measure on the hour of the day.

The last table shows that, in Denmark, the sun is on the whole an unsatisfactory and unreliable source of light, because the number of clear days is comparatively small. Along certain parts of our coasts the conditions are undoubtedly better than at Copenhagen, and during the warm season there is, besides, no risk in letting the patients go about out of doors naked, even when the sky is not uninterruptedly clear but is clouded over now and then, because they get inured to the exposure in remarkably short time, so that they can stand going naked also in the shade, provided only the place where they take their sun-bath is sheltered from too much wind.

We have said that in a flat country the chemical force of the sun is greater on the coast than farther inland. This is not, however, the same as to say that the sun cannot be utilised back from the coast. Many reports from inland hospitals testify to good effects having been obtained there, too; though at the same time they acknowledge the superiority of the results obtained at the sea-side sanatoria. As a matter of fact, all hospitals, or at least all those that are not situated in the very midst of large urban agglomerations, ought to be provided with the necessary accommodations for

giving sun-baths, not only so as to be able to utilise this treatment in any occurring case of tuberculosis, but also in order to enable them to use it preventively against that disease, as well as in the various other affections where its effects are manifestly beneficent.

At those seasons of the year when it is impossible to utilise the sunlight, artificial sources of light must be resorted to, as it has to be done in many hospitals in the cities nearly all the year round. —

Artificial Sources of Light

Of these, only a few contain any considerable quantities of chemical light or are in other respects suitable for the purposes of general irradiation. The only ones worth considering are: the carbon-arc light, the mercury-arc light, the iron-arc light and the tungsten-arc light.

As already mentioned, there is a considerable difference between these four sources of light. The carbon-arc light has a continuous spectrum, while the spectra of the others are line spectra; and, as I have already pointed out, the results of the various investigations, and more particularly those of the clinical experiments, have shown the importance of always as far as possible using a light with continuous spectrum. If we were to use a light with line spectrum, it would have to be one particularly rich in the inner ultra-violet, the violet and the blue, and there would also have to be strong lines in the red end of the spectrum; but these conditions are not fulfilled by any of the three arc-lamps with line spectrum just mentioned.

The matter is seen most clearly by a comparing of the energy-spectra of the carbon-arc light and the mercury light. Unfortunately, no such comparative investigations have as yet been made as regards the non-concentrated carbon-arc light and the so-called »artificial mountain sun». The undertaking was planned at the Finsen Institute long ago, but up to now the impossibility of obtaining the requisite lenticular apparatus — though these were ordered years and ages ago — has necessitated its postponement. We are hoping to receive the prisms in a near future, however, and the work will then be taken in hand immediately.

In the meantime a series of already existing comparative studies, by Prof. S. A. Johansen (Strahlentherapie, vol. VI), concerning the respective values of the carbon-arc light and Kromayer's mercury-quartz lamp in local light-treatment can very well serve to give an idea of the conditions which we are dicussing here.

If we look at the curves worked out by Prof. JOHANSEN, we see that the mercury light has a few very strong lines in the inner ultra-violet and the violet, but that it has its chief strength in the ultra-violet rays of short wave-length, while the carbon-arc light has a continuous spectrum rich both in ultra-violet, violet and blue rays. In addition to this, the carbon-arc light is very strong both in the luminous red and the ultra-red rays; and, what is also worth noticing, it is rich in long-wave ultra-violet rays.

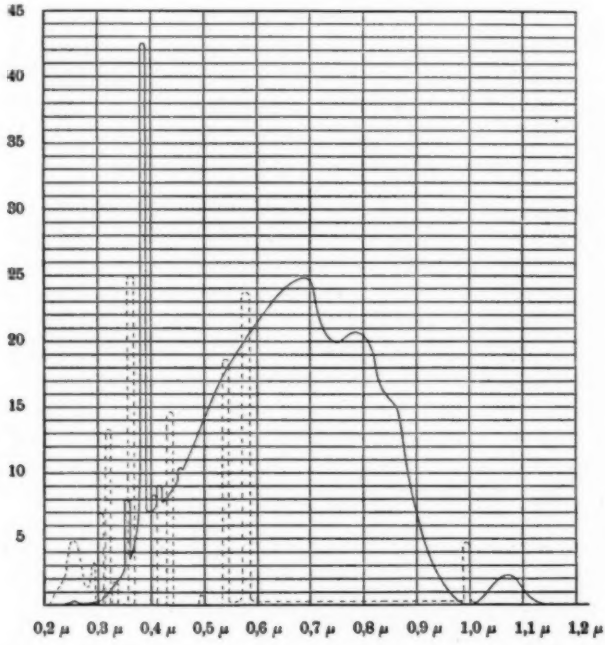

Fig. 1. The energy spectrum in the concentrated carbon-arc light (the solid curve). The energy-spectrum in KROMAYER's mercury quartz lamp (the dotted curve).

The iron and tungsten-arc lights compare even less favorably with that of the carbon-arc. —

There is an intimate connection between these facts and the lack of penetrating power characteristic of both the iron-arc and the mercury-arc light, even at high amperages. It will be remembered, from what I said in the beginning, that this penetration is so feeble that even very thin layers of exsanguinated tissue suffice to absorb all the chemical rays of these lights; and these conditions of ab-

sorption tell us that neither with the iron-arc light nor with the mercury-arc light do we reach down into the blood-carrying layers of the skin, in which it is undoubtedly very important, however, that the chemical effect of the light should be able to exercise itself.

In order to test the matter clinically, I have myself made some comparative investigations concerning the curative effect of general irradiation with mercury light and carbon-arc light, respectively. The results invariably showed the mercury light to be vastly inferior to the carbon-arc light as regards the curative effects produced in various forms of tuberculosis — the very disease in which, up to the present, general light-treatment is chiefly and most extensively employed.

Of the artificial, chemical sources of light, we should therefore always by preference and as far as possible use the carbon-arc light; but, as we shall see later, it is necessary that the lamps should be constructed with this special, light-therapeutical use in view. The lamps for ordinary illuminating purposes found in the market cannot be used at all.

Of course, I do not mean categorically to stamp the other artificial sources of light — and especially not the mercury-arc lamp — as utterly useless. On the contrary, there are cases in which the mercury light is to be preferred, as, for instance, in the case of patients who cannot support the heat emitted by the carbon-arc; but these cases are few, after all, and we must not expect to get results as good as those obtained with the carbon-arc light. Also in the treatment of children the mercury light can often be used to advantage, because tuberculosis in the child yields altogether far more easily to treatment than the same disease in the adult. But the carbon-arc light is unquestionably the best. This is also the opinion expressed by several other writers; for instance by SCHANZ (Strahlentherapie, vols. VIII and IX) and KIMMERLE (ibid., vol. XII).

Let us now look a little at each of the four lamp-types to which I have just been referring.

I. The Carbon-Arc Lamp

For the purpose of general irradiation with carbon-arc light only direct-current power can be used, because the light which is chiefly useful in this connection is the one emanating from the white-glowing crater, which contains all the rays of the spectrum, while the arc itself contains mostly ultra-violet rays of short wave-length. The

crater forms on the upper carbon, which is thicker than the negative, lower one. Alternating current cannot be used, because it causes a constant shifting of the poles, as a result of which no crater is formed; and at the same time the light is thrown upwards and downwards by turns, so that the only light that can be used is the light of the arc itself, of which we have just said that it contains very few penetrating rays, which are precisely the ones that are most absolutely important.

The more a substance approaches the state of white heat, the more light, and especially the more chemical light, does it emit. For this reason it is important that the crater should be as intensely white-glowing as it can possibly be made. This is done by charging the carbons of the lamp as strongly as possible; which is the same as to say that the carbons used should be of the smallest diameter commensurable with any given strength of current.

That this is correct has been shown by means of experiments made at the Finsen Institute, by ABSALON LARSEN (Meddelelser fra Finsen's medicinske Lysinstitut, II). Through a lamp the upper carbon of which had a diameter of 14 mm., while the diameter of the lower carbon was 11 mm., he sent currents of, respectively, 5, 6 and 13.6 ampères; and he ascertained that under these conditions the chemical effect of the light from the crater increased from 13.3 to 59.2. With the use of carbons respectively 24 mm. (upper), and 15 mm. (lower) in diameter, and currents of, respectively, 18.5 and 43.5 ampères, the chemical effect of the crater-light was 62.2 and 276. The increase in temperature with increased amperage was far less.

The results of these experiments show the enormous importance of using carbons of the proper diameter for each given amperage.

The tension across the arc is another matter of importance. With an amperage of 7.7 the chemical effect is: at 40 volts, 13.3; at 55 volts, 15.1. At a higher tension — as, for instance, of 60 volts — the chemical effect becomes very variable. The experiments showed the most suitable voltage to be from 50 to 55 volts.

At the Finsen Institute we use, for general irradiation, lamps of either 20 or 75 ampères, with an arc-tension of 55 volts. For the 20-ampère lamps the upper, or positive, carbon has a diameter of 12 mm., and the lower, or negative, carbon a diameter of 8 mm. The upper carbon must be cored. — For the 75-ampère lamps the carbons are, respectively, 31 and 22 mm. in diameter, and for this lamp both carbons are cored ones. For both types of lamps the length of the carbons should be 300 mm. If they are shorter, they are consumed too quickly; and to use longer ones is inadvisable for

practical reasons. It is of great importance to use only carbons of the very best quality, as otherwise the lamps will burn badly. At the Finsen Institute we always use the »Siemens A», of which, after having tried innumerable other brands, we find that it is the carbon which can stand the highest charge, and which, consequently, gives the strongest chemical light. — The lamps are self-regulating, and in a manner which ensures, among other things, that the point of combustion is absolutely invariable. The latter requirement is a necessary one, in order that the light from the upper crater may always fall in the same place. It is obtained by means of an arrangement which makes the carbon holders of the upper and lower cathode move toward one another at the same speed and for the same distance, and by choosing carbon diameters proportioned to one another in such a way that the two carbons are both consumed at the same rate of speed.

The regulation of the lamps must be very exact, so as not to allow the tension across the arc to vary more than 0.25 to 0.50 volt, at most.

The 20-ampère lamps have differential regulation; the 75-ampère lamps have shunt regulation. —

From all this you will see that if the lamps to be used in general light-bath treatment are to fulfill all these requirements they must be specially constructed for the purpose. This is also what we have been doing at the Finsen Institute; but as regards the details of that construction I would refer you to vol. IV of the »Acta Radiologica», which contains a paper, by Dr. COLLIN, Inspector CHRISTENSEN and myself, on »Technique, Dosage and Armamentarium in General Light-bath Treatment». The lamps must be free-burners; that is, they must not be surrounded by any sort of globe, because a globe would absorb a portion of the chemical light. Even in the case of a blown quartz globe, for instance, this kind of absorption would take place, owing to the accumulation of various combustion products on its inner surface.

At the Finsen Institute, we use the 75-ampère lamps in groups of two, and the 20-ampère lamps in groups of three. We use the former in the treatment of patients who can sit up, and the latter for patients who have to lie down during the irradiation.

Of course, a 75-ampère lamp irradiates much more chemical light than a 20-ampère lamp; but at the same time it also irradiates a great deal more heat. This means that the 20-ampère lamp can be approached much more closely than the one of 75 ampères. The intensity of the light being in inverse ratio of the square of the distance, a patient placed at a distance of 100 cm. from the arc

will receive an irradiation only one fourth as intense as if he were placed only 50 cm. away. The difference in strength, between the two lamps, can therefore be more or less made up for by placing the patient who receives treatment by the 20-ampère lamp so much closer to the arc. With a group of two 75-ampère lamps, from six to eight seated patients can be treated at one time; by a group of three 20-ampère lamps, two patients lying down can receive treatment simultaneously. If there are many patients who can take the treatment sitting up, the use of the 75-ampère lamps, consequently, means a consumption of from 20 to 25 ampères per patient, while

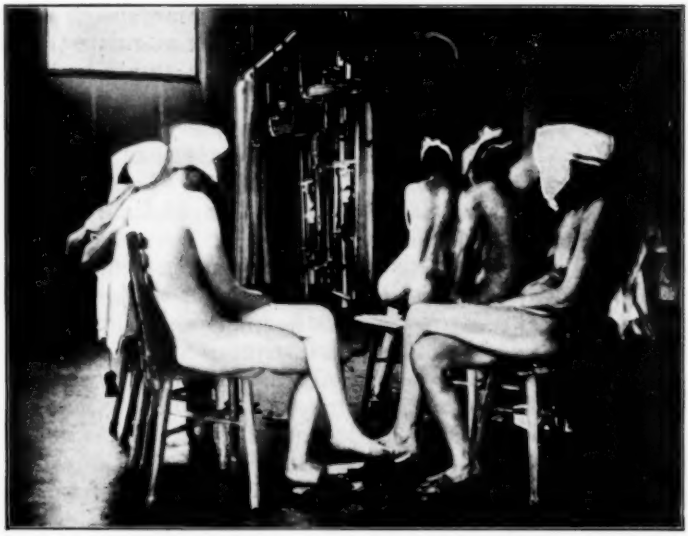

Fig. 2. Light Bath with 75-ampère Lamps.

with the small lamps the consumption is 30 ampères per patient. If the person to be treated has to be lying down the 20-ampère lamp is the cheapest, because even with two lamps of 75 ampères it would not be possible to treat more than two persons at one time, seing that with a larger number, in the recumbent position, they would obstruct the light for each other.

The details concerning the mounting of the lamps and the dosage of the light are all to be found in the article, just alluded to, in the »Acta Radiologica».

There is, of course, nothing to prevent the use of other amper-

ages, if so desired, but the lamps would, in such a case, have to be constructed with a view to the particular strength of current desired. At all events, 75 ampères is the highest that should ever be used, because it is very difficult to construct a lamp that will burn steadily and evenly with a higher amperage.

It is absolutely necessary that the carbon-arc lamps used for light-bath treatment in tuberculosis should fulfill the requirements which I have stated here. The so-called »Aureol Lamp», which burns with a very high tension across the arc and is based chiefly on the utilisation of the light from the arc itself, is no good in this connec-

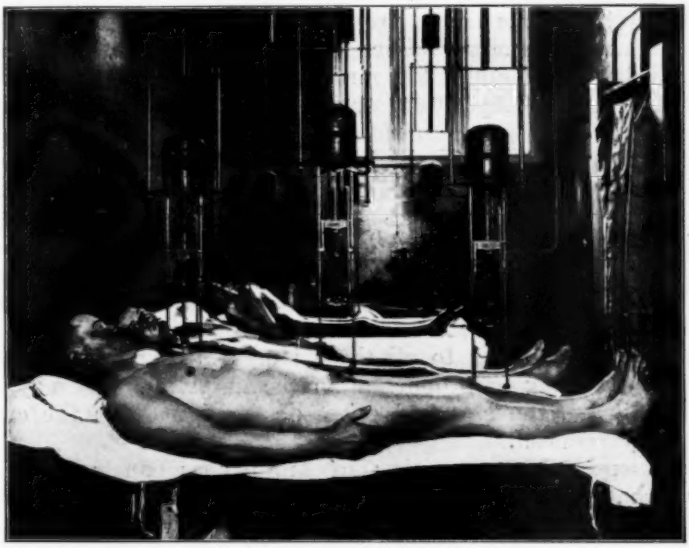

Fig. 3. Light Bath with 20-ampère Lamps.

tion, because the light of the arc does not contain anywhere near the same quantity of chemical rays, and especially not of long-wave chemical rays, as the light from the crater.

Several types of lamps have been constructed, also, with a view to adapting the tension across the arc to the strength of current available. One of these is the »Jupiter» lamp, of 10 ampères and 35 to 40 volts. But both this amperage and this voltage are too low, also when two or three of these lamps are used together in one group for the irradiation of several patients simultaneously. Also of the »Mebolith» lamp, of 5.5 ampères and 45 volts, it must

be said that it does not meet the conditions required of a carbon-arc lamp for general light-treatment.

Attempts have been made to increase the chemical effect by adding various metals to the carbons, but as a rule the result has only been an increase in the quantity of short-wave rays, which is, of course, to no purpose whatsoever, inasmuch as the carbon light already contains a sufficient quantity of these rays. Besides, carbons prepared in this manner discharge various kinds of vapors decidedly unpleasant, if not outright poisonous, to patients and attendants alike, which necessitates the lamps being fitted with special blow-out contrivances in order to get rid of these vapors; something which complicates the treatment without being of the slightest assistance. I must therefore advise against the use of such carbons, irrespectively of whether the metallic substance is mixed with the carbon itself to a composition, or is simply applied as a coating on the outside.

Some makers of carbon-arc lamps place reflectors behind the carbons in order to intensify the effect of the chemical light. At the Finsen Institute we have tried several of these reflectors, but the effect is not sensibly increased, and the only result is that the lamps cannot be used for the irradiation of several persons at one time, because the reflectors prevent the light from radiating in more than one direction.

A drawback common to all these lamps is that they use carbons altogether too thick in proportion to the amperage, whereby, as already mentioned, the chemical effect of the light from the crater is considerably reduced.

There exist also a number of lamp-types constructed for use with alternating current, but, as I have already said, this kind of current should never be used.

Mercury Quartz Lamps

It would lead us too far, if I were to attempt, here, a detailed description of the construction of the mercury lamp; a description which can, moreover, be found in almost any text-book on radiotherapeutics. A thoroughly detailed description of this lamp is given in HANS MEYER'S: »Lehrbuch der Strahlentherapie, vol. I.». The arc is formed between two mercury poles, and the light emitted is the pure mercury spectrum.

The lamp exists in various types of construction, and of these

the »Bach» lamp and JESIONECK's »Artificial Mountain Sun» are the ones most generally used.

The »Bach» lamp is enclosed in a hemispherical reflector of polished aluminium, and the JESIONECK lamp in a hollow pyramid coated with magnolium to reflect the light. JESIONECK's lamp is intended for use in a large room containing a number of these lamps arranged in such a manner that the patients are irradiated from all sides at once.

To make up the for paucity of heat rays in the mercury light, HAGEMANN surrounded BACH's »artificial mountain sun» with a ring of ordinary incandescent lamps. JESIONECK recommends the use of powerful metal-filament incandescent lamps in connection with the mercury-light irradiation, ana uses for that purpose the so-called »sollux» lamp. But it is, of course, chiefly the heat- and luminous rays of which the quantity is increased by all these arrangements, and they do not to any noticeable extent alter the fact that the carbon-arc light is far superior to the mercury light.

One fact about the mercury-quartz lamps which should be called particular attention to is their great variability of performance.

With a consumption of 0.66 kilowatt per hour, for instance, at 110 volts, a lamp of the JESIONECK type — which, in my opinion, is the best one — has a candle power of 2000 candles; while, with a consumption of 0.77 kilowatt per hour, at 220 volts, it produces a light of 3000 candles.

As a considerable drawback we must also consider the manner in which the intensity of the light gradually decreases with continued use of the burner. It is generally stated that the burner has to be changed after from 600 to 700 hours of use, because, by that time, the intensity of the light will have been lessened very considerably, owing to the gradual clouding of the quartz tube.

It is of the very greatest importance always to have the lamp burn with a full charge of current, because the quantity of chemical light increases very much with the amount of current used.

Quite recently, there has appeared in the market still another type of mercury-quartz lamp — the »Wiusol» lamp — of which it is claimed that the quartz does not become cloudy by use.

The »Bang» Iron Lamp

In this lamp the arc is formed between water-cooled iron electrodes, two sets of which are placed between two metal plates, thus making it possible to utilise the light from two lamps simultaneously.

Each lamp burns with 3.5 ampères, and the light is only the absorption spectrum of the iron. It will be evident from what I have already said with regard to the iron light that it cannot be used to any advantage in the treatment of surgical tuberculosis.

The Tungsten Lamp

The arc is formed between tungsten electrodes. The light is a line spectrum. The lamp burns with 5 ampères and from 60 to 100 volts. Of this lamp, too, it will be understood, from what has been said in the foregoing, that it cannot take the place of the carbon-arc lamp.

In conclusion I would like to say that, of the three last-named sources of light, the mercury arc light is absolutely to be preferred.

Also various types of metal-filament incandescent lamps of high candle power have been constructed for the purposes of general irradiation; but as they all produce chiefly heat rays, and only very small quantities of chemical rays, they have no interest in this connection and need not even be discussed. —

SUMMARY

The author begins by briefly sketching the history of general light-treatment and mentions some of the investigations made, especially by FINSEN and his pupils, concerning the capacity for penetration into the living tissue, of light from a number of different sources. Various conditions and problems connected with the cure of surgical tuberculosis by means of light-treatment are dwelt on, and it is pointed out that the attempts to account for the curative effect of the light in these affections have not, up to the present, led to any result; one question especially, in this connection, remaining unsolved; the question, namely, as to what particular rays in the light are chiefly instrumental in bringing about the cure. The clinical results, on the other hand, furnish some hints and show that the chemical rays — and among these notably the more long-waved ultra-violet, the violet and the blue ones — must be particularly important, but that also the luminous red rays play a certain rôle. On the basis of these considerations the author states as his opinion that the sunlight, wherever it can be utilised, is by far the best, and that sanatoria for surgical tuberculosis should always by preference be located either in alpine country or by the sea, in both of which situations all those rays are present in the sunlight in a high degree of intensity. The sunlight is only of use when it contains abundant quantities of chemical light. In northern Europe it is therefore during a considerable part of the year impossible to profit by the sun, because the greater portion of its chemical rays

are absorbed by the atmosphere. During these periods, recourse must be had to artificial light. Various sources of artificial light are mentioned, and it is strongly argued that, of all these, the carbon-arc light is the best. The lamps must be specially constructed for this purpose, however; because most of the lamps found in the market do not satisfy the special requirements of this particular utilisation. Only direct current power can be used, because it is the light from the crater that plays the important part in the treatment.

ZUSAMMENFASSUNG

Der Autor skizziert zunächst in Kürze die Geschichte der allgemeinen Lichtbadbehandlung und erwähnt einige von den Untersuchungen, die besonders von FINSEN und seinen Schülern darüber ausgeführt worden sind, in welchem Grad Licht verschiedener Quellen lebendes Gewebe zu durchdringen vermag. Er berührt verschiedene Bedingungen und Probleme, die mit der Behandlung chirurgischer Tuberkulose mittels Lichtbädern verbunden sind und erwähnt, dass die Versuche die heilende Wirkung des Lichtes auf diese Affektionen zu erklären, bisher noch zu keinem Resultat geführt haben. Besonders eine hierhergehörige Frage ist ungelöst geblieben, nämlich die, welche Strahlen im Licht es sind, die hauptsächlich heilkräftig wirken. Anderseits geben uns die klinischen Ergebnisse manche Andeutungen und zeigen, dass die chemischen Strahlen — und darunter besonders die langwelligeren ultravioletten, die violetten und die blauen — besonders wichtig sein müssen, dass aber auch die leuchtenden roten Strahlen eine gewisse Rolle spielen. Auf Grund dieser Erörterungen spricht der Autor seine Auffassung dahin aus, dass das Sonnenlicht, wo es verwendet werden kann, weitaus am besten ist, und dass Sanatorien für chirurgische Tuberkulose immer vorzugsweise in alpinen Gegenden oder an der See errichtet werden sollten, in welchen beiden Lagen das Sonnenlicht alle diese Strahlen in hohem Intensitätsgrad besitzt. Das Sonnenlicht ist nur von Nutzen, wenn es reichliche Quantitäten von chemischem Licht enthält. Im nördlichen Europa ist es deshalb durch einen beträchtlichen Teil des Jahres nicht möglich von der Sonne Nutzen zu ziehen, weil der grösste Teil ihrer chemischen Strahlen durch die Atmosphäre absorbiert wird. Während dieser Perioden muss man seine Zuflucht zum künstlichen Licht nehmen. Verf. erwähnt verschiedene künstliche Lichtquellen und bringt starke Argumente dafür vor, dass das Kohlenbogenlicht von allen die beste ist. Allerdings müssen die Lampen für diesen Zweck besonders konstruiert sein, da die meisten von den im Handel erhältlichen nicht den speciellen Forderungen dieser besonderen Verwendung genügen. Nur direkter Strom kann benützt werden, da es das Licht des Kraters ist, dass die wichtigste Rolle in der Behandlung spielt.

RÉSUMÉ

L'auteur fait, en débutant, un bref historique du traitement photothérapique général et signale les recherches faites, en particulier par FINSEN et ses élèves, sur la capacité de pénétration dans les tissus vivants de la lumière

provenant d'un certain nombre de sources différentes. Il s'étend sur les conditions et sur les problèmes divers se rapportant au traitement de la tuberculose chirurgicale par la photothérapie et indique que les tentatives faites pour expliquer l'action curative de la lumière dans ce genre d'affection sont restées jusqu'à ce jour sans résultat; à cet égard, une question est restée particulièrement insoluble: celle de savoir quels sont, dans la lumière, les rayons ayant une action curative prépondérante. Les résultats cliniques donnent, d'autre part, quelques indications et démontrent que les rayons chimiques — et notamment les rayons ultra-violets à grande longueur d'onde, les rayons violets et les rayons bleus — ont une action particulièrement importante, mais que les rayons rouges jouent également un certain rôle. En s'appuyant sur ces considérations, l'auteur exprime la conviction que, toutes les fois qu'on pourra y recourir, la lumière solaire est la plus efficace et conclut que les sanatoria pour tuberculose chirurgicale devront toujours être construits soit dans des régions alpestres soit au bord de la mer, situation dans lesquelles les rayons précités offrent dans la lumière solaire un très haut degré d'intensité. La lumière solaire n'est utile qu'autant qu'elle est très riche en rayons chimiques. Dans le nord de l'Europe, il sera donc impossible de recourir pendant une grande partie de l'année à cette source lumineuse, la majeure partie des rayons chimiques étant absorbée par l'atmosphère. On aura donc recours pendant ces périodes, à la lumière artificielle. L'auteur énumère diverses sources de lumière artificielle et déclare catégoriquement que la meilleure est celle à l'arc de charbon. Les lampes devront être spécialement construites pour l'usage que l'on se propose; c'est pourquoi, la plupart des lampes que l'on trouve dans le commerce ne répondent pas aux exigences de cette utilisation spéciale. On ne pourra se servir que de courants continus, la lumière issue du cratère positif jouant le rôle le plus important dans le traitement.

LA LYMPHOGRANULOMATOSE MALIGNE

Résultats obtenus par l'auteur avec la röntgenthérapie. Les principes du traitement et leur application. Valeur de la biopsie pour le diagnostic [1]

par

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Avant-Propos

La littérature médicale a mentionné jusqu'à présent assez peu de chose sur les résultats de la röntgenthérapie appliquée à la lymphogranulomatose maligne, et de plus, une bonne partie de ce qui a été publié se rapporte à des malades chez qui le diagnostic n'avait pas été confirmé par l'examen histologique. Ces cas, si intéressants qu'ils soient par ailleurs, ne peuvent nous aider à juger les résultats de la röntgenthérapie sur la maladie en question: en effet le diagnostic, posé sur les données cliniques, hématologiques et röntgenologiques peut fournir en général une certitude suffisante pour qu'on puisse se permettre de fonder sur lui une méthode de traitement, mais il reste pourtant toujours plus ou moins spéculatif, tant qu'il n'est pas certifié par l'examen histologique.

De même, les communications sur les résultats du traitement chez un ou deux malades, ont peu de signification pour aider à juger la valeur de la röntgenthérapie et ces cas provenant d'écrivains différents ne peuvent non plus, à notre avis, être réunis utilement.

Dans les derniers temps seulement, il a été communiqué quelques résultats encourageants de l'application des rayons X à la lymphogranulomatose maligne. Malheureusement, il est très difficile de juger de leur réelle portée: la guérison n'a encore jamais été ob-

[1] D'après une conférence tenue pour la Soc. d'électrologie et de röntgenologie Néerlandaise le 1 Mars 1925 à Amsterdam.

tenue; les auteurs, à un seul près, ne mentionnent pas le maximum du temps que leurs malades ont passé sans récidive et le seul point de repère pour apprécier les résultats de la röntgenthérapie nous est donc fourni par le nombre d'années dont cette dernière a prolongé la vie des malades.

L'évaluation de cette prolongation peut se faire le plus exactement, si on taxe pour chaque malade en particulier au début de la röntgenthérapie, le temps qu'il lui resterait à vivre, si on ne lui appliquait pas le traitement, et de voir ensuite de combien d'années sa vie a dépassé le chiffre obtenu. Aucun auteur n'a employé cette méthode d'évaluation, et nous devons donc essayer de déduire nous-mêmes des différentes communications:

la *D*urée de la vie *A*près l'apparition des *P*remiers *S*ymptômes (DAPS)

la *D*urée de la vie *A*près le début de la *R*öntgen *T*hérapie (DART)

et comparer la moyenne ainsi obtenue avec la moyenne des mêmes chiffres chez des malades non traités.

Mais il ne faut pas nous dissimuler que ces chiffres sont le produit de facteurs en partie inconnus, susceptibles d'influencer grandement les résultats thérapeutiques; nommons ainsi la gravité de l'état des malades au début du traitement, et la malignité de l'affection; ne va-t-il pas sans dire que plus grave est la maladie, plus court sera le temps compris entre l'apparition des premiers symptômes et un stadium donné?

Il est à regretter que différents auteurs ne mentionnent que le DAPS (*D*urée de la vie *A*près l'apparition des *P*remiers *S*ymptômes), d'autres seulement le DART (*D*urée de la vie *A*près le début de la *R*öntgen *T*hérapie); d'autres enfin ne laissent pas comprendre de quel chiffre il s'agit. Nous avons essayé de préciser ces deux chiffres autant que possible, à l'aide des données communiquées.

Holding et Brown.[1] 18 cas, dont 17 bioptiquement certifiés, 3 individus perdus de vue, 4 chez qui le traitement fut arrêté. Les auteurs parlent de « duration », mais n'indiquent pas clairement s'ils veulent dire par là DAPS ou DART. Pour les 10 individus, restés sous observation on trouve DAPS (ou DART?) à une moyenne de > 1 an $^{8}/_{10}$ (pour 4 décédés 2 ans $^{3}/_{10}$, pour 6 vivants > 1 an $^{4}/_{10}$).[2]

Yates et Bunting.[3] 63 cas; l'examen histologique ne fut fait que dans les cas douteux (combien?). Les résultats pour les cas diagnostiqués histologiquement et ceux qui ne l'avaient pas été ne

[1] Holding and Brown, Journ. of Am. med. Assoc. $^{3}/_{3}$, 1917.

[2] Nous avons placé devant le chiffre se rapportant à des malades encore en vie, le signe $>$ pour indiquer que le chiffre suivant est en réalité plus élevé.

[3] Yates and Bunting, Journ. of Am. med. Assoc. $^{10}/_{3}$ 1917.

sont pas mémorés à part. Les cas graves (11) n'ont apparemment pas été soumis aux rayons X; des 52 autres, 39 sont restés sous traitement. On peut déduire DART à >1 an $^5/_{10}$. Il n'est pas clair seulement combien de ces 39 ont été traités aux rayons X. Les auteurs appliquent d'ailleurs largement, en plus de la röntgenthérapie, la thérapie chirurgicale et la vaccinothérapie. Il y a dans leur matériel bon nombre de cas bénins.

Cette analyse montre suffisamment que leurs données sont inutilisables pour le but que nous nous proposons.

Chaoul et Lange.[1] 12 cas, dont 9 bioptiquement confirmés. Les données sur ces 9 cas et celles sur les 3 autres ne sont pas mentionnées à part. Pour ce qui regarde la longueur de la vie, les auteurs ne s'expriment pas clairement, mais ont vraisemblablement mis sur la même ligne le début de la maladie et celui du traitement, de sorte que DAPS = DART. 2 individus succombent par suite de maladie intercurrente; des 10 autres, 8 vivaient encore, avec DAPS (ou DART?) >3 ans et un temps sans récidive de >2 ans $^1/_2$; pour tous les 10, on compte >2 ans $^7/_{10}$. Il faut retirer de ces nombres une durée de « quelques mois » pour 7 cas chez qui l'affection a été généralisée, et on peut donc dire que DART est >2 ans $^4/_{10}$.

Schreiner et Mattick.[2] 46 cas, tous examinés histologiquement; 31 traités par la röntgenthérapie (on n'eut jamais de nouvelles de l'un de ces 31); ces 30 malades furent traités de plus par le radium, l'arsenic, le vaccin ou l'émétine. DART n'est pas à déduire des données connues; DAPS est mémoré à part pour chaque individu. La moyenne paraît être pour 8 vivants >2 ans $^6/_{10}$, pour 22 morts 2 ans $^7/_{10}$ pour tous >2 ans $^7/_{10}$.

Gillet.[3] 10 cas, tous avec diagnostic histologique; ils proviennent de différents radiothérapeutes et aussi de la littérature. Communications sur DAPS pour 7 individus; 4 morts avec DAPS de 4 ans $^1/_{10}$, 3 vivants avec >4 ans $^7/_{10}$, pour tous >4 ans $^5/_{10}$. A l'aide des différentes observations, nous pouvons énoncer DART pour chacun de ces groupes en particulier: 2 ans $^5/_{10}$, >2 ans $^8/_{10}$ et >2 ans $^6/_{10}$.

Il découle de ce qui précède que 2 auteurs seulement mentionnent des résultats où DART a atteint plus de deux ans; ce sont Chaoul et Lange avec >2 ans $^7/_{10}$ pour tous, et >2 ans $^4/_{10}$ pour les cas généralisés, puis Gillet avec >2 ans $^6/_{10}$.

Si nous rappelons maintenant l'opinion, encore très répandue, que

[1] Chaoul und Lange, Münch. med. Wochenschr. 1923 n° 23 et Strahlentherapie, 1923, Bd 15, p. 620.

[2] Schreiner and Mattick, Am. Journ. of Roentg. Aug. 1924, p. 133.

[3] Gillet, Thèse de Paris, 1924.

la röntgenthérapie, si elle peut procurer un grand soulagement aux malades, ne leur donne pourtant que très exceptionellement une prolongation de vie notable, il me paraît utile de démontrer par nos observations personnelles l'injustice de cette manière de voir. Et cela d'autant plus, que, tout récemment encore, KLEWITZ et LULLIES,[1] soutenus par les résultats qu'ils ont obtenus chez 24 malades, pour qui ils ne mentionnent pas d'examen histologique, en viennent à la conclusion que la röntgenthérapie paraît ne pas prolonger la durée moyenne de la vie des individus atteints de lymphogranulomatose maligne.

Résultats personellement obtenus par la Röntgenthérapie

Nous avons examiné et traité nous-mêmes tous les malades dont il sera parlé ici; le diagnostic fut confirmé chaque fois par l'examen histologique, soit pendant la vie, soit à l'autopsie. Tous les cas ne répondant pas à ces exigences ont été laissés de côté, même quand la maladie et l'examen clinique ont été caractéristiques.

Nous avons ainsi un choix de 19 cas, traités après l'année 1915, et les données qui suivront rendent l'état des choses au 1 Mars 1925. Les malades proviennent des cliniques ou policliniques des professeurs PEL, RUITINGA et SNAPPER, et de notre clientèle particulière.

Sexe. On compte sur les 19 individus 11 femmes et 8 hommes. Les cliniques en question disposent d'un même nombre de lits pour les hommes que pour les femmes et la clientèle privée se recrutant indifféremment dans l'un et l'autre sexe, on peut donc conclure de notre matériel que rien ne dénote une prédilection de la maladie pour le sexe masculin, comme le pensent SCHREINER et MATTICK (1. 7: 1).

L'âge des malades au moment où fut posé le diagnostic varie entre 20 et 40 ans, excepté un malade de 8 ans, un de 16 et un de 49; la moyenne était de 29 ans.

A part le traitement symptomatique des complications sérieuses, la röntgenthérapie fut seule appliquée, à l'exclusion de tout autre traitement, et en particulier celui des préparations arsénicales. Ces 19 cas sont partagés en deux groupes principaux, différenciés eux-mêmes en deux catégories: une pour les malades décédés avant le $^1/_3$ 1925, l'autre pour ceux encore vivants à cette date.

Les tableaux ci-joints donnent à $^1/_4$ près le nombre des années mentionnées dans chaque rubrique. Pour ce qui concerne le début de la maladie, il est compté du moment où le sujet dit avoir remarqué les premiers symptômes (hypertrophie des ganglions, prurit, fatigue,

[1] KLEWITZ und LULLIES, Klin. Wochenschr. 1924, p. 276.

etc.). Le nombre d'années, que, sans röntgenthérapie, le malade aurait probablement vécues après le début du traitement, a été évalué pour chacun en rapport avec son état et ce que l'on sait de la marche ordinaire du procès sans röntgenthérapie.

Groupe 1

Résultats de la röntgenthérapie chez tous les malades qui furent soumis à un traitement rationnel

Résultats obtenus dans le Groupe 1

1	2	3	4	5	6	7	8	9	10
N°	Sexe	Age au début de la r. th.	Temps écoulé des premiers symptômes au début de la r. th.	[Evaluation.] Durée de la vie entre début r. th. et mort (si la r. th. n'avait pas été appliquée)	[Evaluation.] Durée totale de la vie après l'apparition des premiers sympt. (si la r. th. n'avait pas été appliquée) [Somme des rubriques: 4+5]	*D*urée de la vie *A*près le début de la *R*öntgen *T*hérapie [DART]	*D*urée totale de la vie *A*près l'apparition des *P*remiers *S*ymptômes [DAPS] [Somme des rubriques: 4+7]	Prolongation de la vie par suite de la r. th. [Différence des rubriques: 7—5]	Validité depuis le début de la r. th.
A. Morts									
1	f	31	1	1/4	1 1/4	6 1/4	7 1/4	6	4 3/4
2	f	35	1	1/2	1 1/2	4 3/4	5 3/4	4 1/4	3 1/2
3	m	16	1/2	3/4	1 1/4	2 3/4	3 1/4	2	1 3/4
4	m	20	1/2	1/4	3/4	2 3/4	3 1/4	2 1/2	1/2
[5	f	25	1	1/2	1 1/2	1/2	1 1/2	0	0]
6	m	21	1	1/4	1 1/4	1	2	3/4	1/2
[7	f	49	3	1/4	3 1/4	1/2	3 1/2	1/4	0]
Moyennes pour tous les morts			1.1	0.4	1.5	2.6	3.8	2.3	1.5
pour les morts, ayant eu traitement intégral			0.8	0.4	1.2	3.5	4.3	3.1	2.2
B. Vivants									
8	f	38	1	1	2	> 4 1/4	> 5 1/4	> 3 1/4	> 3
9	m	8	1 1/2	3/4	2 1/4	> 3 1/2	> 5	> 2 3/4	> 3
10	f	26	2	1/2	2 1/2	> 3 3/4	> 5 3/4	> 3 1/4	> 3
11	m	32	1	1/4	1 1/4	> 3/4	> 1 3/4	> 1/2	> 0
Moyenne pour les vivants			1.4	0.6	2.0	> 3.0	> 4.4	> 2.4	> 2.3
Moyenne pour tous			1.2	0.5	1.7	> 2.8	> 4.0	> 2.3	> 1.8
Moyenne pour tous qui ont eu traitement intégral . .			*1.0*	*0.5*	*1.5*	> *3.3*	> *4.3*	> *2.8*	> *2.2*

Avant de parler des résultats du traitement, remarquons qu'il ne s'agit nullement ici d'un matériel choisi parmi des individus légèrement atteints. Bien au contraire; l'état de plusieurs malades était désespéré (nos. 1, 4, 6, 7); très grave pour d'autres (2, 5, 10, 11) et chez tous, l'affection s'étendait sur différentes parties, y provoquant de grosses tumeurs. Tous durent être admis dans un hôpital ou une clinique, à l'exception du no. 8, qui avait pourtant déjà des localisations étendues aux ganglions rétropéritonéaux et à gauche au dessus de la clavicule et au cou.

Jusqu'à présent il a été impossible de réaliser une guérison, tous les malades sont morts par suite de leur lymphogranulomatose, et pour les 4 qui vivent encore, le temps écoulé depuis la dernière manifestation de leur maladie est trop court pour qu'il soit permis de parler de guérison.

Pourtant si cette dernière fait défaut, les résultats obtenus sont satisfaisants. Tandis que ZIEGLER,[1] disposant d'un matériel de 70 cas (dont 40 fixés bioptiquement) donne pour la moyenne de DAPS moins de deux ans, voici ce que nous avons obtenu: Pour 5 malades dont 3 étaient dans un état désespéré ou très alarmant au début du traitement, DAPS était plus de 5 ans (7 ans $^1/_4$ même, puis $5\ ^3/_4$, $> 5\ ^1/_4$, > 5 et $> 5\ ^3/_4$); DART était $6\ ^1/_4$, $4\ ^3/_4$, $> 4\ ^1/_4$, $> 3\ ^1/_2$ et $> 3\ ^3/_4$; la prolongation de la vie était de 6 ans, $4\ ^1/_4$, $> 3\ ^1/_4$, $> 2\ ^3/_4$, $> 3\ ^1/_4$; la validité depuis le début du traitement: 4 ans $^3/_4$, $3\ ^1/_2$, > 3, > 3, > 3.

Si nous considérons *la moyenne* des résultats, il faut observer tout d'abord que des 11 malades, il y en a deux chez qui le traitement eut lieu dans des circonstances toutes particulières. Chez l'une (n° 5), il y avait une complication de tuberculose très étendue des glandes lymphatiques, et de plus, elle avait un enfant au sein; chez l'autre (no. 7), la présence d'un grand exsudat dans la plèvre empêchait d'appliquer le traitement comme il aurait dû l'être à une grosse tumeur médiastinale et pulmonaire, il fallut même l'interrompre.

Nous avons pourtant placé ces malades dans le groupe 1, de sorte que nous avons ici le résultat de tous les cas chez qui il n'y avait pas de contrindication au traitement et où il fut donc appliqué quand nous le jugeâmes nécessaire. Mais en réalité, si l'on veut avoir une juste idée du traitement sur la lymphogranulomatose, non compliquée avec des affections exigeant l'insuffisance de la röntgenthérapie, il faut éliminer du groupe 1 les numéros 5 et 7. Les moyennes ainsi obtenues sont ajoutées à l'aperçu suivant:

[1] ZIEGLER, Die Hodgkin'sche Krankheit. Jena, 1911.

Tableau 2

	*D*urée de la vie *A*près l'apparition des *P*remiers *S*ymptômes [DAPS]	*D*urée de la vie *A*près le début de la *R*öntgen *T*hérapie [DART]	Prolongation de la vie par suite de la röntgenthérapie	Validité depuis le début de la r. th.	
A pour 7 morts	3.8	2.6	2.3	1.5	
B pour 4 vivants	>4.4	>3.0	>2.4	>2.3	tous les cas
C pour tous les 11	>4.0	>2.8	>2.3	>1.8	
D pour 5 morts (de la rubrique A)	4.3	3.5	3.1	2.2	cas ayant eu traitement intégral
E pour B+D (9 cas)	>4.3	>3.3	>2.8	>2.2	

Autrement dit, dans une maladie qui conduit en moyenne à la mort moins de deux ans après l'apparition des premiers symptômes, *la durée de la vie est prolongée en moyenne:*

de plus de 2 ans $^{3}/_{10}$ *pour tous les malades soumis à un traitement rationnel* (11 individus, dont 4 encore en vie); *le temps de leur validité dure plus de 1 an* $^{8}/_{10}$ [et DAPS > 4 ans, DART > 2 ans $^{8}/_{10}$];

de plus de 2 ans $^{8}/_{10}$ *pour tous les malades* (9 dont 4 encore en vie) *chez qui il n'y avait au début du traitement ni complication, ni circonstances pathologiques obligeant à une röntgenthérapie insuffisante; leur temps de validité dure plus de 2 ans* $^{2}/_{10}$, [et DAPS > 4 ans $^{3}/_{10}$, DART > 3 ans $^{3}/_{10}$].

Comparons maintenant les résultats du groupe 1 avec ceux du

Groupe 2

Résultats de la röntgenthérapie qui a laissé à désirer pour une raison quelconque, indépendamment de la lymphogranulomatose elle-même

Il n'y a pas assez longtemps que les 2 malades encore en vie sont sous traitement pour qu'on puisse tirer de leur état actuel des données sur l'influence exercée par la röntgenthérapie sur la durée de la prolongation de leur vie. Cette prolongation ne sera vraisemblablement pas bien longue: le n° 18 a cessé de se soumettre au traitement avant même que les manifestations granulomateuses aient disparu, et le n° 19 souffre d'une complication de tuberculose pulmonaire diffuse qui a nécessité l'arrêt du traitement.

Parmi les 6 défunts, les n° 12 et 13 ne furent pas traités lors d'une récidive pour des causes non médicales; DART n'était resp. que 1 an $^{1}/_{4}$ et $^{1}/_{2}$ an, la vie fut prolongée de $^{3}/_{4}$ et de $^{1}/_{4}$ d'année, le temps de validité fut $^{1}/_{4}$ d'année et 0.

Résultats obtenus dans le Groupe 2

1	2	3	4	5	6	7	8	9	10
N°	Sexe	Age au début de la r. th.	Temps écoulé des premiers symptômes au début de la r. th.	[Evaluation.] Durée de la vie entre début r. th. et mort (si la r. th. n'avait pas été appliquée)	[Evaluation.] Durée totale de la vie après l'apparition des premiers sympt. (si la r. th. n'avait pas été appliquée) [Somme des rubriques 4+5]	*D*urée de la vie *A*près le début de la *R*öntgen *T*hérapie [DART]	*D*urée totale de la vie *A*près l'apparition des *P*remiers *S*ymptômes [DAPS] [Somme des rubriques 4+7]	Prolongation de la vie par suite de la r. th. [Différence des rubriques 7—5]	Validité depuis le début de la r. th.
A. Morts									
12	f	27	1¼	½	1¾	1¼	2½	¾	¼
13	f	37	1	¼	1¼	½	1½	¼	0
14	f	39	¼	?	?	1¼	1½	?	0
15	m	24	2	?	?	2	4	?	?
16	m	36	½	?	?	2½	3	?	?
17	f	29	¼	?	?	1¼	1¼	?	0
Moyenne pour les morts			0.9	?	?	1.7	2.3	?	?
B. Vivants									
18	m	31	1	½	1	>¼	>1¼	>−¼	>0
19	f	29	¾	¼	1½	>¼	>1	>0	>0

Les 4 autres ont été traités en premier lieu, ailleurs que chez nous, d'une façon insuffisante. D'après ce que les malades communiquèrent sur leur état et le fait qu'ils avaient pu être traités sans être admis dans une clinique, on peut conclure qu'ils étaient moins sérieusement atteints que les individus du groupe 1; on ne saurait donc expliquer par la gravité de leur état au début du traitement les résultats moins favorables que ceux obtenus au groupe 1. A notre premier examen, ces 4 malades étaient dans un état des plus alarmants; 2 à 6 mois plus tard, ils étaient morts tous les quatre, malgré l'institution d'un nouveau traitement aux rayons X, qui dût d'ailleurs être interrompu par suite de contrindications.

Pour pouvoir juger les résultats du traitement sur les 6 malades décédés de ce groupe, et les comparer avec ceux du groupe 1, nous n'avons malheureusement pas le nombre d'années de vie gagnées grâce à la röntgenthérapie, puisque n'ayant pas vu les malades avant le début du traitement, nous n'avons pu faire d'évaluation à

ce sujet. C'est pour cela que nous mettrons en face l'un de l'autre DART de chacun des deux groupes. Ce chiffre est ici 1 an $^{4}/_{10}$, tandis que dans le groupe 1, il est >2 ans $^{8}/_{10}$ (>3 ans $^{3}/_{10}$, quand il y a eu un traitement intégral). Cela veut dire que *la durée moyenne de la vie à partir du début du traitement pour ceux qui ont été insuffisamment soumis à la röntgenthérapie (groupe 2) est moindre de 1 an* $^{4}/_{10}$ *que pour ceux du groupe 1 et de plus de 1 an* $^{9}/_{10}$ *que pour ceux traités intégralement.*

Nous pouvons admettre, je crois, que ce résultat n'est pas la suite de circonstances quelconques, mais de l'insuffisance du traitement.

Il nous semble pouvoir déduire de ce qui précède, que la röntgenthérapie est susceptible de donner des résultats plus favorables qu'on ne le pense en général; et cela non par exception ou par suite d'un matériel spécial: on peut dire que c'est la règle, avec la restriction obligatoire qu'impose un matériel restreint.

Méthode de Traitement. Principes et leur application

La grande variété de la lymphogranulomatose maligne, aussi bien pour l'étendue du procès que pour la façon dont réagit l'organisme, oblige à individualiser fortement le traitement. Il n'y a pas à entrer dans le détail de ce dernier pour chaque individu en particulier; les circonstances occasionnelles amenant pour tout cas nouveau des particularités qui n'ont en somme aucune signification essentielle, leur discussion ne ferait que troubler les grandes lignes.

Les principes que nous avons appliqués et qui, à notre avis doivent être suivis pour chaque traitement dont on espère autre chose qu'un succès d'estime, peuvent être formulés ainsi:

1) Le tissu granulomateux doit absorber une dose suffisante de rayons X. (*Intensité.*)

2) L'étendu du traitement doit être en rapport avec celle de l'affection. (*Extension.*)

3) Il faut immédiatement reprendre le traitement à l'apparition d'une récidive. (*Récidive.*)

Il est nécessaire de donner quelques explications un peu plus amples sur la façon dont nous avons mis ces principes en pratique.

1) Intensité

Il faut que la dose soit assez forte et administrée dans un espace de temps tel, que les masses granulomateuses irradiées diminuent graduellement de volume pendant la période du traitement, pour arriver, si possible, à ne plus être accessible à l'observation directe, et cela, sans que les tissus sains qui ont dû forcément être irradiés

soient endommagés de façon durable. La méthode que nous avons employée sans y rien changer d'essentiel pendant les 10 années sur lesquelles s'étend notre statistique, donne satisfaction à cette exigence, bien qu'il vienne un moment où cela n'est plus possible. Ce moment arrive tôt ou tard pour chaque individu, soit que des irradiations antérieures aient diminué la sensibilité du tissu granulomateux, soit que l'application de la dose nécessaire devienne impossible (localisation étendue dans les poumons, pleurésie exsudative); soit encore parce que, vue l'étendue du procès, il est à craindre que l'organisme ne puisse supporter la dose nécessaire à la disparition de toutes les localisations.

En ce qui concerne la technique que nous avons employée, on peut se rapporter aux données qui vont suivre:

Nous irradions généralement chaque porte d'entrée jusqu'à 90 % de la dose d'érythème. Une à deux portes sont irradiées par jour, quelquefois avec un intervalle de quelques jours. Pour les portes très larges et les très grandes distances anti-cathode-peau, la dose par porte est donnée en 2 ou 3 jours. On prend la même précaution si elle est exigée par des états locaux, comme par exemple en cas de compression de la trachée et des grandes bronches.

Il faut de la sorte 2 à 4 semaines pour une série d'irradiations et il se résorbe ainsi dans le tissu granulomateux à peu près 70 % de la dose d'érythème. Trois mois après cette première série, on en donne souvent une seconde.

Quant aux autres détails techniques, il est impossible d'en formuler des règles, les circonstances variant d'après l'étendue des régions à traiter; ceci soit dit pour la grandeur des portes, pour la distance de l'anti-cathode à la peau, ainsi que pour le filtre et la tension secondaire. Cette dernière comporte en général 160 à 200 kilovolt et nous avons employé comme filtre $^1/_2$ millimètre de zinc et un millimètre d'aluminium.

2) Extension

Deux principes doivent nous guider ici:

A. Toutes les localisations du procès doivent être irradiées.

B. Les tissus bien portants ne doivent être irradiés que dans la plus stricte nécessité.

Ad A) *Tous les localisations du procès doivent être irradiées.* Si l'on n'irradie qu'une partie des localisations, elles croissent sur les endroits non traités et l'on n'obtient d'amélioration que sur place; s'il y a parfois des exceptions, ce principe reste la règle.

Si, en effet, il peut se produire quelquefois une réaction à distance, il ne faut pas oublier que c'est seulement dans des circonstances très spéciales. Lors d'une rapide résorption de grandes

masses granulomateuses, il peut disparaître quelquefois en même temps de petits ganglions situés en dehors des parties irradiées.

Nous avons communiqué ailleurs [1] à ce sujet des exemples frappants, observés dans des circonstances telles que le fait doit être considéré comme certain (diminution de volume de ganglions situés en dehors du cône mathématique de rayonnement, et si loin de ce dernier que les rayons secondaires émis dans le cône n'ont pu les influencer; exclusion de la possibilité d'irradiation directe involontaire à travers l'enveloppe de l'ampoule, exclusion facilement prouvée par les bandelettes de KIENBOECK; facile contrôle de la grosseur des ganglions à cause de leur situation périphérique, et que plusieurs personnes ont exercé indépendamment les unes des autres.

Mais pour que puisse se produire cette réaction à distance, il faut qu'il y aie rapide résorption de grosses masses et même alors, elle n'est pas assez forte pour provoquer une réaction intense; elle peut au besoin faire disparaître de petits ganglions, mais c'est tout au plus si elle diminuera le volume de grands lymphomes. Par conséquent, si dans des circonstances spéciales, on peut, en irradiant de grosses tumeurs, essayer d'en faire disparaître une petite située à distance, et qu'on préfère ne pas traiter directement pour épargner les tissus environnants, il n'en faut pas conclure que ce soit une raison de négliger l'obligation de la recherche minutieuse de toutes les masses granulomateuses, pour les irradier sans exception.

Deux parties du corps surtout, exigent sous ce rapport la plus grande attention: le médiastin et l'abdomen. Pour le contrôle du médiastin, l'examen radiologique est un moyen de premier ordre. Mais il est beaucoup plus difficile de trouver à la palpation dans l'abdomen les paquets ganglionnaires qui auraient pu s'y former. On sait qu'on ne peut jamais être convaincu par le résultat négatif d'un examen et avoir la certitude de l'absence de ganglions dans l'abdomen. Aussi appellerons nous tout spécialement l'attention sur la palpation abdominale des malades dans un bain très chaud où ils sont couchés commodément. Il m'est souvent arrivé, grâce à cette méthode d'examen, de découvrir des tumeurs que, ni d'autres, ni moi, n'étions parvenus à découvrir à l'examen ordinaire. Cet examen minutieux du médiastin et du ventre est d'autant plus nécessaire que ces organes renferment souvent des ganglions hypertrophiés.

Pour ce qui concerne la localisation dans le médiastin, nous comptons parmi nos 19 individus avant le début du traitement, 11 malades avec une grande tumeur médiastinale et 3 autres chez qui l'hypertrophie des ganglions médiastinaux était moins forte; chez

[1] VOORHOEVE, Ned. Tijdschrift v. Geneeskunde, 1921, II, p. 3131.

2 autres, les ganglions se développèrent au cours de la maladie et chez 3 individus seulement ils ne se manifestèrent pas pendant la vie. (Un de ces 3 vit encore, un autre s'est retiré à l'observation 4 mois avant sa mort, mais l'autopsie a révélé des lymphomes médiastinaux.)

Quant aux lymphomes de l'abdomen, nous les avons constatés deux fois avant le début du traitement, et 8 fois après. Nous ne pûmes les trouver chez les 9 autres individus, mais à l'autopsie de 3 d'entre eux, on trouva des ganglions rétropéritonéaux hypertrophiés.

On pourrait croire maintenant, que, vu la difficulté de reconnaître la présence de ganglions hypertrophiés abdominaux, il est prudent d'aller au plus sûr et d'irradier le ventre en tous cas systématiquement. Nous ne croyons pas que cela soit la bonne manière de faire. Si les glandes abdominales, en effet, ne restent pas indemnes à la longue, on peut pourtant admettre que dans beaucoup de cas elles le sont plus ou moins longtemps, et alors non seulement l'irradiation est inutile, mais encore elle est en flagrant délit avec le principe énoncé que:

B) *Les tissus bien portants ne doivent être irradiés que dans la plus stricte nécessité.*

On ne saurait en effet trouver indifférent que dans la même série de röntgenthérapie tout le ventre soit irradié, en plus des parties où la lymphogranulomatose est constatée avec certitude; on soumet ainsi à de très fortes doses une grande partie du corps et des organes encore sains. Une irradiation si étendue peut avoir des suites graves, nous mentionnerons seulement les profonds désordres pouvant survenir dans la composition du sang. Si après de semblables tours de force, parfois indispensables, on compte les corpuscules de sang blancs, on peut se demander sérieusement si on a le droit d'exposer ses malades sans nécessité, à une diminution de leucocytes au-dessous de 2,500. A moins de raison grave, cela nous paraît interdit. La plus grande prudence doit nous aider à déterminer l'extension du traitement. *Autant il est nécessaire de donner aux irradiations une assez grande extension, autant il est nuisible de les appliquer sans nécessité à de trop grandes étendues.* L'organisme en général, et l'appareil sanguin en particulier, ne supportent qu'une quantité restreinte de rayons X; si l'on applique le traitement mal à propos, on peut se voir obligé de le cesser avant que le tissu granulomateux n'ait absorbé les doses nécessaires, car il se pourrait autrement que le malade, délivré de ses lymphomes, ne vienne à mourir de cachexie röntgenologique.

Après avoir prévenu contre l'extension inutile de la röntgenthérapie, nous nous occuperons de savoir jusqu'où, en cas de nécessité, on peut étendre le traitement sans porter à l'organisme un

dommage irréparable. Nous avons pu constater que dans la lymphogranulomatose maligne le nombre des corpuscules de sang blancs peut très fortement diminuer sans que des dégâts irréparables soient portés à l'appareil sanguin. Il nous paraît de grande importance pour le radiothérapeute d'être au courant de ce fait. Le chiffre minimum de leucocytes atteint par nos malades était habituellement de 3,000 à 5,000: deux fois seulement nous le vîmes descendre à 2,400 et dans un cas, sur lequel il sera revenu plus loin, à 300. Pour ce dernier cas excepté, la leucopénie ne fut jamais accompagnée d'une diminution de la teneur d'hémoglobine ou des érythrocytes; au bout de quelques semaines d'ailleurs, tout était rentré dans l'ordre.

Chez un de nos malades qui avait eu avant le début du traitement 70 % d'hémoglobine, 16,000 leucocytes et 4 millions d'érythrocytes, il survint une anémie grave avec 18 % d'hémoglobine, 300 leucocytes et 800,000 corpuscules rouges, des hémorragies dans la rétine et un état général extrêmement grave. Cette anémie avait progressé successivement, les leucocytes étaient descendus dans les 6 semaines de traitement jusqu'à 2,300; le minimum fut atteint deux mois après, puis la normale revint lentement, de sorte que 6 mois plus tard l'hémoglobine était à 72 % avec 4.2 millions d'érythrocytes et 5,600 leucocytes. Mais, à vrai dire, la normale ne se rétablit jamais complètement: l'hémoglobine ne put dépasser 80 %, les corpuscules rouges 4.4 millions et les blancs 6,000. Cette malade était, quand elle vint chez nous, dans un état désespéré, sa rate dépassait la médiane de deux travers de doigts, et il y avait de très gros lymphomes aux endroits les plus différents. Il fut établi pendant le traitement, qui devait naturellement être très étendu, 2 pauses de 6 jours chacune, mais chaque fois, pendant ce repos, survinrent de nouvelles localisations, et la température remonta, de telle sorte, que nous ne pûmes partager les irradiations sur une plus longue période de temps: il fallut courir le risque d'abîmer l'appareil sanguin.

Il nous paraît que les observations ci-dessus sont de grand intérêt, quand il est question d'arrêter ou non des irradiations nécessairement étendues, par crainte des dégâts irréparables que pourrait subir l'appareil sanguin; il faut en effet se souvenir que *chez les lymphogranulomateux la leucopénie peut atteindre un degré très avancé sans dommage irréparable pour l'organisme.* Mais on n'oubliera pas d'un autre côté que la diminution de leucocytes survenue pendant la röntgenthérapie est progressive, elle n'atteint son maximum que longtemps après la fin des irradiations; il faut donc les cesser bien avant l'apparition du minimum admissible.

Pourtant, bien qu'il y ait eu chez nos malades restitution ad integrum dans tous les cas où la leucopénie n'est pas arrivée à moins

de 2,300, il n'en faut pas conclure qu'un pareil abaissement soit sans risque. Il se pourrait en effet que pour certains individus la limite que la leucopénie peut atteindre sans préjudice irréparable, soit plus élevée que pour d'autres. On ne peut méconnaître non plus que durant la période où le malade dispose d'un nombre si restreint de leucocytes, il est gravement en danger d'être victime d'une infection par suite de l'affaiblissement de ses moyens de résistance.

3) Récidive

Comme nous l'avons dit plus haut, nos 13 malades décédés le sont tous par suite de leur lymphogranulomatose maligne. Tous ont eu en fin de compte une ou plusieurs récidives, malgré le temps plus ou moins long qu'ils ont passé sans en avoir. C'est ainsi que dans les 9 cas du groupe 1 où le résultat de la röntgenthérapie put être jugé intégralement nous avons constaté comme plus longues périodes sans récidive: 5 ans $^3/_4$, $3^1/_2$, $1^3/_4$, $^1/_2$, $^1/_2$, $> 2^1/_4$, $> 1^1/_2$, $> 2^3/_4$ et $> ^1/_4$ ou en moyenne > 2 ans $^1/_{10}$.

Le traitement immédiat de la récidive est de la plus haute importance, c'est pourquoi le malade doit être tenu constamment sous le contrôle le plus sévère. Nous avons la persuasion que grâce à cette mesure strictement observée avec nos malades, des débuts de récidive ayant pu être irradiés dès leur apparition, ont été enrayés.

La récidive débutante est généralement facile à diagnostiquer. Le malaise général, la fièvre, la diazo-réaction positive, l'augmentation des leucocytes, surtout des polynucléaires neutrophiles avec un pourcentage trop élevé des formes jeunes, des signes de toxicité dans le protoplasma des leucocytes (granula toxica) et l'apparition d'un plus grand nombre de grands monocytes et souvent aussi une augmentation des éosinophiles qui peut être très forte, du prurit et parfois d'autres manifestations dermatiques, voilà les symptômes généraux accompagnant la récidive. Pour sa localisation, toux d'irritation, pression symptômatique sur les nerfs (névralgies, herpès) et douleurs rhumatismales nous montrent la route à suivre; il ne faut pas borner son attention à la croissance des ganglions périphériques et de la rate, car il y a encore le médiastin, les poumons, l'abdomen et le squelette à réclamer un examen minutieux.

Notre expérience apprend qu'on arrive ainsi presque toujours à découvrir en quelques jours la localisation de la récidive, diagnostiquée sur les symptômes de réaction générale.

Dans les cas exceptionnels où la localisation ne peut ainsi être découverte, il est bon, à notre avis, de penser à irradier la rate, surtout si elle a été autrefois atteinte de la maladie et si l'état général du malade ne permet pas de délai avant le début du traitement.

Dans deux cas où nous prîmes ce parti, nous eûmes la bonne fortune de pouvoir ainsi localiser la récidive et de la refouler. Si parfois cette irradiation d'essai sur la rate ne donne pas de résultats, il est à considérer d'en essayer une semblable sur les ganglions rétropéritonéaux.

Il est parfois très difficile de discerner si les symptômes constatés sont ceux d'une récidive ou d'une maladie intercurrente, comme il s'en produit souvent chez les lymphogranulomateux, proie facile pour une infection par suite de leur résistance amoindrie. Plusieurs de nos malades ont été dans un état alarmant non provoqué par une récidive; nommons seulement une pyæmie avec journellement 3 brusques poussées de fièvre, atteignant $> 40°$; une pneumonie croupeuse avec un empyème postpneumonique, une violente colique néphrétique.

Nous ne nous arrêterons pas aux symptômes qu'accompagnaient ces affections, pas plus qu'aux difficultés de diagnostic différentiel qu'elles provoquèrent. Disons seulement que la marche du procès laissait de bon droit exclure la récidive et recommandons la prudence avant de la diagnostiquer, quand un lymphogranulomateux est gravement malade.

Autres remarques se rapportant à la röntgenthérapie

1) *Influence de l'irradiation sur la température.* La température généralement élevée avant le traitement, monte souvent, surtout quand il y a eu forte résorption de tissu granulomateux, après la première séance, mais redevient normale après quelques jours. Après les irradiations suivantes, on constate quelquefois encore de l'hyperthermie, mais alors elle est généralement insignifiante; telle que, elle n'est point une contrindication pour la continuation de la röntgenthérapie, mais il est nécessaire de veiller dès le début à ne pas donner aux irradiations une trop grande intensité et extension pour ne pas provoquer une trop forte hyperthermie.

Longtemps avant la fin de la première série l'état s'améliore sensiblement et la température s'abaisse, et c'est seulement dans les cas où le tissu granulomateux, ayant déjà été irradié une ou plusieurs fois, a perdu de sa sensibilité que l'améliorisation peut ne pas se faire sentir. Par ailleurs, l'amélioration est un phénomène si constant que si elle ne se produit pas après l'irradiation de grosses tumeurs, on peut à notre avis y voir une indication importante: des localisations étendues, démontrées ou pas, n'ont pas été irradiées, ou bien il existe des complications, ou bien encore, et surtout s'il n'y a pas diminution de volume de la tumeur, le diagnostic est faux.

Nous avons été amenés ainsi à bien reconnaître une complication de tuberculose pulmonaire déjà soupçonnée (la recherche répétée des bacilles de Koch dans les crachats, restée toujours négative, fut renouvelée avec résultat positif). Dans un second cas, il parut y avoir de la dégénération amyloïde, et dans un troisième des métastases diffuses dans toute la moëlle des os.

2) Le *prognostic* est moins favorable: quand il y a des localisations dans les poumons, surtout quand elles sont étendues, des exsudats pleurétiques; des localisations dans les ganglions abdominaux et de la complication avec tuberculose des glandes lymphatiques.

3) *Les contrindications à la röntgenthérapie* sont fournies par la tuberculose pulmonaire, si la lymphogranulomatose siège au médiastin ou dans le poumon; par les métastases multiples dans la moëlle des os; par les inflammations aigues, siégeant aux environs des localisations granulomateuses.

Valeur de l'examen bioptique pour le diagnostic

On s'accorde généralement à admettre que le diagnostic de lymphogranulomatose maligne doit, pour ne faire aucun doute, être confirmé par l'examen histologique.

Malheureusement on ne saurait méconnaître que souvent dans les cas certains le diagnostic ne pouvant être confirmé, même après l'enlèvement d'une glande suspecte, la valeur de la biopsie a un peu baissé dans l'esprit de quelques uns, qui, par suite, ne pratiquent plus régulièrement l'enlèvement d'un ganglion.

C'est pourquoi, désirant nous former un jugement éclairé sur la valeur de l'examen bioptique, nous ne nous sommes pas arrêtés à des impressions, mais avons recherché attentivement si les résultats de l'examen sont souvent négatifs, dans des cas où la maladie est certaine. Nous appellerons dans la suite « *diagnostic négatif* » celui de tous les cas où, pour quelle raison que ce soit, la biopsie n'a pas donné le diagnostic certain de lymphogranulomatose maligne.

En étudiant les 19 cas dont nous avons parlé, il se trouve que pour 18 d'entre eux il fut fait un ou plusieurs examens bioptiques (21 en tout), pour 4 autres il y eut aussi l'autopsie et pour la 19ième l'autopsie seulement. Le résultat de ces examens bioptiques fut 17 fois positif et 4 fois négatif.

Quant aux malades, ils se classent ainsi: sur les 18 individus, à la première épreuve, la biopsie fut positive pour 14 et négative pour 4 autres; chez 2 de ces derniers il y eut une seconde épreuve qui fut positive.

Ces données ne sont fournies qu'à titre de renseignement, car il ne faut pas nous dissimuler que pour répondre à la question posée, il ne faut pas comparer le nombre des épreuves positives et celui des négatives faites sur nos malades. Ceux-ci sont en effet choisis parmi de nombreux sujets, justement à cause du diagnostic histologique positif, de sorte que nous mentionnons tous ceux dont la biopsie fut positive, et de ceux dont elle fut négative, seulement les individus qui, à l'autopsie, parurent avoir été atteints de lymphogranulomatose maligne. Reste à savoir, combien de malades, non autopsiés, et dont l'examen histologique fut négatif, étaient réellement atteints de l'affection: nous sommes ici dans l'ignorance puisque nous ne saurions considérer le diagnostic clinique comme décisif.

Il nous faut donc suivre une autre route et c'est pourquoi nous prendrons comme base le nombre d'autopsies qui révélèrent la lymphogranulomatose. De cette façon, nous ne donnerons la préférence ni aux cas bioptiquement positifs, ni aux négatifs.

Cinq de nos malades ont été autopsiés, mais 4 seulement avaient subi la biopsie qui fut positive pour 2 et négative pour les 2 autres.

Etant donné ce petit nombre, nous avons cherché à nous renseigner sur un plus grand matériel d'autopsies, et grâce à l'aimable bienveillance du Professeur DE VRIES, nous avons été mis au courant des autopsies faites à l'hôpital de l'Université dans les 10 dernières années. Pendant cette période, l'autopsie avait révélé 23 fois la lymphogranulomatose maligne, mais de ce nombre, il n'y avait eu de biopsie que pour 4 cas; le diagnostic en avait été 2 fois positif et deux fois négatif.

Si nous ajoutons nos cas autopsiés à ceux du Prof. DE VRIES, il faut remarquer qu'une de nos biopsies positives figure aussi dans le groupe du Professeur de V., de sorte que nous avons, pour 7 autopsies, 3 biopsies positives et 4 négatives. Si petits qu'ils soient, ces chiffres montrent suffisamment que la biopsie est souvent négative dans les cas où la lymphogranulomatose est certaine.

A quoi faut-il attribuer cela et n'est-il pas possible d'obtenir de meilleurs résultats?

Pour la réponse à ces questions, trois points réclament notre attention.

1) *L'image typique pathognomonique histologique* montre le polymorphisme cellulaire, un grand nombre d'éosinophiles, de grandes cellules à noyau excentrique et oval; et dans un stadium plus avancé les cellules de STERNBERG, qui avec les ilôts de nécrose et l'augmentation du tissu conjonctif, allant plus tard jusqu'à la sclérose avec une forte diminution des lymphocytes, en forment les symptômes principaux.

On sait pourtant que la lymphogranulomatose ne donne pas toujours l'image histologique complète. Il va sans dire que si on exige la présence de tous les caractéristiques, on devra plus souvent prononcer un « non liquet », que si on se décide à poser aussi le diagnostic quand les cellules de STERNBERG, éléments les plus caractéristiques, font défaut.

Mais s'il s'agit de tracer ici une limite, on est en face d'une question que les pathologues-anatomes eux-mêmes n'ont pas encore résolue.

L'expérience et une plus grande connaissance de la portée des changements histologiques dans ces cas, nous renseigneront avec le temps, mais il est certain qu'actuellement il est du plus grand intérêt de mettre des exigences si sévères à la pose d'un diagnostic positif, que celui-ci ne puisse faire le moindre doute.

Mais s'il nous faut encore accepter comme inévitable les diagnostics négatifs, conséquence d'un image histologique non typique, nous devons tout de même concentrer nos efforts pour en rendre le nombre aussi petit que possible en apportant le plus grand soin dans le choix de la glande à extirper pour la biopsie. Il est important d'en prendre une qui soit certainement en croissance, aussi bien d'après l'observation clinique que d'après celle du malade lui-même.

On pourra exclure de cette façon les glandes lymphatiques où le procès est à la dernière phase; c'est justement alors que les chances sont grandes de n'avoir pas l'image histologique typique, parcequ'il se forme à la longue dans le tissu granulomateux des masses de tissu conjonctif, et les signes typiques finissent par disparaître complètement. Il est vrai que longtemps encore il reste sur les bords des parties propres à faire le diagnostic, mais c'est pourtant une chance de moins en moins fréquente. Les glandes lymphatiques, où le procès est arrivé à ce stade n'ont plus la tendance à croître, elles sont de consistance plus ferme, dure même parfois. Il faut éviter de les choisir pour en faire l'examen histologique.

2) Le diagnostic négatif peut avoir aussi pour cause la *combinaison de la lymphogranulomatose avec une tuberculose des glandes lymphatiques*. On risque alors de faire la biopsie d'une glande tuberculeuse. Une attention excessive jointe à une grande expérience peuvent aider à soupçonner de tuberculose une glande lymphatique hypertrophiée, on peut même arriver à en être certain, mais cela est une exception, de sorte qu'il reste toujours le risque d'extirper un ganglion tuberculeux pour l'examen histologique. C'est pour cela qu'il est bon de se rappeler que le fait de trouver une tuberculose typique (bacilles de KOCH inclusivement) n'exclut pas

la possibilité que le malade soit en plus atteint de lymphogranulomatose, même si l'affection ne siège pas au ganglion examiné.

C'est donc une faute de renoncer à un diagnostic clinique établi sur de bonnes bases, dans un cas à marche typique, pour la seule raison qu'on a trouvé de la tuberculose dans la glande extirpée. Le cas nº 5 en est un très bon exemple; le diagnostic lymphogranulomatose avait été posé cliniquement; l'examen histologique démontra de la tuberculose typique avec bacilles de Koch. Le diagnostic fut pourtant maintenu après d'amples réflexions et la tuberculose des glandes lymphatiques considérée comme une complication. L'autopsie découvrit une tuberculose des glandes lymphatiques étendue, mais, bien qu'après de longues recherches, on trouva aussi la lymphogranulomatose.

3) Le diagnostic négatif peut encore être la suite d'un *mauvais choix du matériel à extirper.*

Il est connu que l'image histologique peut devenir impossible à reconnaître par suite d'irradiations précédentes, même quand les glandes comme telles sont encore faciles à palper. L'examen d'une glande irradiée augmente donc les chances d'un diagnostic négatif.

Les cas 1 et 15 donnent illustration de ce fait. Pour le cas 1, l'extirpation avant le traitement fut refusée; après que la malade eût passé deux années sans récidive, quelques petits ganglions lymphatiques du cou, seuls restes palpables de la maladie, semblèrent s'hypertrophier légèrement; cette fois-ci on put procéder à l'extirpation, mais la biopsie ayant démontré exclusivement du tissu conjonctif avec dégénération hyaline, on ne put poser aucun diagnostic. Pour le nº 15, par suite de raisons inconnues, l'extirpation n'eut pas lieu avant le début du traitement, mais assez vite après; les ganglions irradiés avaient beaucoup diminué de volume, mais pas disparu; l'examen de l'un d'eux démontra un tissu si peu typique que deux pathologues anatomes des plus expérimentés ne purent faire de diagnostic.

Des années plus tard, quand une récidive survint chez le nº 1 et que le nº 15 se soumit à notre traitement, des ganglions furent extirpés avant les nouvelles irradiations et la biopsie donna l'image typique de la lymphogranulomatose maligne. Il faut donc faire l'examen histologique, pour peu que cela soit possible, avant de commencer le traitement. Si dans un cas particulier, l'extirpation est impossible avant les irradiations, et qu'elle n'aie lieu qu'après leur début, on doit être doublement difficile sur le choix du ganglion.

Il découle de ce qui précède que si en raison des connaissances actuelles de l'anatomie pathologique et de la combinaison possible de la tuberculose avec la lymphogranulomatose maligne on ne puisse

éviter parfois un diagnostic histologique négatif, il y a du moins la possibilité de diminuer sa fréquence; en quoi peuvent grandement aider les indications ci-dessus pour le choix du matériel à extirper qu'il ne faut pas laisser dépendre exclusivement des conditions topographiques-anatomiques. Eviter surtout les glandes dures, qui ne croissent plus, de même que celles déjà irradiées.

Le nombre des malades chez qui le diagnostic histologique est négatif peut être diminué encore par l'exécution d'une seconde biopsie, si la première n'a pas donné l'image typique.

En regardant maintenant les causes de la négativité de l'examen chez nos malades, on y trouve une illustration de la justesse de ce qui est avancé plus haut. Pour 2 des 4 diagnostics négatifs, une irradiation antérieure peut avoir été la cause; pour le 3ième, la glande extirpée parut être tuberculeuse; pour le 4ième, la biopsie montra calcification et caséification, mais ni tuberculose, ni bacilles de KOCH, ni signes de lymphogranulomatose; peut-être qu'il y avait ici en jeu une complication tuberculeuse.

Il faut enfin se souvenir que même les résultats négatifs ne sont pas sans valeur: si l'image histologique ne permet pas de poser le diagnostic exclusivement d'après la biopsie, on peut pourtant en retirer souvent des données suffisantes pour que, l'image clinique aidant, il soit permis de se prononcer avec une quasi-certitude. N'est-il pas bien fréquent de voir que, grâce à l'histologie, on puisse exclure complètement le diagnostic de tuberculose et de lymphosarcome, tandis que l'examen clinique laissait hésiter entre une de ces affections et la lymphogranulomatose maligne?

Hypertrophie des glandes périphériques comme symptôme précoce

L'extirpation d'un ganglion lymphatique est possible, presque sans exception. Quand il y a une lymphogranulomatose maligne de la peau, l'examen histologique d'un fragment de peau peut aussi donner des résultats. Il est rare que les ganglions lymphatiques siègent exclusivement à des endroits où des raisons techniques s'opposent à leur enlèvement et l'absence de ganglions périphériques est une rareté tout à fait exceptionnelle.

Chez 14 de nos 10 malades les ganglions furent le premier symptôme qui éveilla leur attention et les mena chez le médecin. 3 des 5 autres avaient remarqué très vite après les premiers malaises une légère hypertrophie des glandes lymphatiques, tandis que chez les 2 autres qui n'en avaient rien soupçonné eux-mêmes, nous pûmes les constater au premier examen, fait 6 mois après le début de la maladie. Si nous pensons que les malades ne s'aperçoivent guère personellement de l'hypertrophie des ganglions avant qu'elle soit dans un état

avancé, nous ne pourrons douter du fait que ce symptôme soit un des plus constants du début de l'affection.

On pourra objecter que ces 19 cas, extraits d'un grand matériel justement à cause de la biopsie positive que la présence des glandes périphériques avait rendue possible, ne sont pas aptes pour aider à juger de la fréquence des cas où ces glandes font défaut. Nous opposerons à cela que même dans les cas non histologiquement prouvés, mais où l'image clinique et la marche de la maladie étaient typiques, les glandes périphériques furent généralement le premier symptôme remarqué par le malade. Elles étaient d'ailleurs toujours palpables au premier examen, ou bien vite après. Il en est de même pour les formes soi-disant abdominale ou médiastinale, dont la littérature mentionne quelques cas où les ganglions faisaient défaut.

Basé sur notre expérience personnelle, il nous faut signaler comme très exceptionnelle la non-hypertrophie des glandes périphériques au début de la maladie, et comme rareté plus grande encore la même chose 6 à 9 mois plus tard.

Nous n'avons jamais vu l'extirpation d'un ganglion avoir de suites fâcheuses, ni chez les lymphogranulomateux, ni chez ceux qui étaient soupçonnés de l'être. Elle fut toujours faite de façon à ce que le ganglion soit retiré totalement, et il fut évité autant que possible de blesser les tissus environnants.

Nous n'avons jamais vu de croissance locale plus prompte, suivre cette extirpation; il est vrai que quelques jours après, la place opérée était irradiée.

Pour récapituler, je dirai donc que quand on soupçonne la lymphogranulomatose maligne ou qu'on en a déjà posé le diagnostic clinique, il faut pratiquer un examen histologique. Cet examen fait sur un ganglion ou un fragment de peau est toujours possible à de rares exceptions près, parce que les glandes lymphatiques périphériques ne manquent presque jamais, même dans les premiers stades.

Le diagnostic histologique négatif n'exclut pas l'existence de la lymphogranulomatose maligne. Il ne faut pas rejeter un diagnostic clinique bien fondé, sous prétexte que l'examen histologique a démontré la tuberculose.

Le nombre de diagnostics négatifs peut diminuer par un choix judicieux de la glande à extirper. Il faut faire l'extirpation avant l'irradiation, non seulement pour avoir certitude de diagnostic avant de commencer le traitement, mais parceque l'irradiation peut défigurer l'image histologique au point de la rendre méconnaissable.

Une seconde épreuve histologique est recommandable au cas, où la première aurait été négative.

RÉSUMÉ

Après un résumé critique de la littérature, on donne les résultats de la röntgenthérapie sur 19 cas de lymphogranulomatose maligne, gravement avancés et histologiquement confirmés. Il en ressort qu'on peut obtenir des résultats beaucoup plus favorables qu'il n'est communément accepté.

Les principes sur lesquelles doit se baser un traitement rationnel aux rayons X et la manière dont il faut l'appliquer, sont exposés. Il est surtout insisté sur la nécessité de traiter chaque localisation par des doses suffisantes, et la récidive immédiatement à son apparition, mais on signale en même temps la nécessité de n'irradier du tissu resté sain que le strict nécessaire.

Il est attiré l'attention sur plusi-urs points importants pour le traitement, comme par exemple la localisation fréquente aux glandes du médiastin et de l'abdomen; le degré de la leucopénie occasionnée par le traitement, qui peut être très forte sans provoquer des dégâts irréparables; la reconnaissance de la récidive; l'influence des irradiations sur la température et sa signification pour le diagnostic; les circonstances qui rendent le pronostic défavorable et les contrindications au traitement.

L'importance de la biopsie pour le diagnostic est amplement discutée. Les recherches sur un matériel d'autopsies montrent que souvent la biopsie ne permet pas de poser le diagnostic de lymphogranulomatose maligne dans des cas certains.

Il est parlé des causes de ce fait et de la possibilité d'apporter une amélioration dans la situation actuelle.

SUMMARY

After a critical review of the literature the author gives the results of the radiological treatment of 19, far advanced cases of malignant lymphogranuloma, the diagnosis having been confirmed by histological examination. It is stated that very much more favourable results can be obtained than is generally believed.

An account is given of the principles by which a rational radiological therapy should be guided and of the manner of application. The importance of treating each local affection with sufficiently large doses is particularly emphasized as well as treating recurrences as soon as they appear. It is pointed out at the same time, however, how important it is not to expose tissues, remaining healed after treatment, to more radiations than is absolutely necessary.

Attention is directed to several important points with regard to the treatment, as for example, the frequent occurrence of the affection in mediastinal and abdominal glands; the degree of leucopenia caused by the treatment and which may be quite marked without giving rise to any permanent damage; the recognition of reccurrences; the influence of the radiations on the temperature and its significance for the diagnosis; the circumstances unfavourable for the prognosis and the contraindications for treatment.

The importance of taking sections for histological examinations is extensively dealt with. Examination of post-mortem material often show that histological examinations during life do not, in certain cases, permit of a diagnosis of malignant lympho-granuloma.

The causation of this is being dealt with as well as the possibility of bringing about an amelioration of this state of affairs.

ZUSAMMENFASSUNG

Nach einem kritischen Überblick über die Literatur werden die Ergebnisse der Röntgentherapie bei 19 Fällen von weit vorgeschrittener, histologisch bestätigter maligner Lymphogranulomatose vorgelegt. Es geht daraus hervor, dass man viel günstigere Resultate erhalten kann, als allgemein angenommen wird.

Verf. setzt die Prinzipien auseinander, auf welchen eine rationelle Behandlung mit Röntgenstrahlen fussen muss und die Art, in der sie zu applizieren sind. Besonders betont er die Notwendigkeit, jede Lokalisation mit genügenden Dosen, und Rezidiven sofort nach ihrem Auftreten zu behandeln, wobei aber auch hervorgehoben wird, dass vom gesund gebliebenen Gewebe nur soviel als unbedingt erforderlich, bestrahlt werden darf.

Verf. macht ferner auf mehrere für die Behandlung wichtige Punkte aufmerksam, wie z. B.: die häufige Lokalisation in den Drüsen des Mediastinums und des Abdomens; den Grad der durch die Behandlung erzeugten Leukopenie, der sehr hoch sein kann, ohne irreparable Schäden hervorzurufen; die Erkennung der Rezidive; den Einfluss der Bestrahlung auf die Temperatur und ihre Bedeutung für die Diagnostik; die Umstände, welche die Prognose ungünstig machen und die Kontraindikationen der Behandlung.

Die Bedeutung der Biopsie für die Diagnostik wird ausführlich besprochen. Die Untersuchungen an einem Material von Autopsien zeigen, dass die Biopsie oft in sicheren Fällen nicht die Diagnose der malignen Lymphogranulomatose zu stellen erlaubt.

Verf. bespricht die Ursachen dieses Verhaltens und die Möglichkeit diesbezüglich eine Änderung zum Besseren herbeizuführen.

AUS DEM AKADEMISCHEN KRANKENHAUS ZU UPPSALA

FREIES GAS IN DER BAUCHHÖHLE

von

Hugo Laurell

Abgesehen von künstlichem Pneumoperitoneum entsteht freies Gas spontan im Bauch am häufigsten nach Perforation gasführender Magen- und Darmteile. Freies Gas im Bauch wird auch allgemein als ein wichtiges klinisches und röntgenologisches Zeichen einer Perforation des Digestionstractus in den Fällen angesehen, wo die Anamnese und die übrigen Symptome in demselben Sinne gedeutet werden können. Das freie Gas kann bekanntlich leicht röntgenologisch nachgewiesen werden und, wenn es nur in kleiner Menge vorhanden ist, kann es auch sicherer röntgenologisch als klinisch nachgewiesen werden. Gerade aus diesem Grunde ist die Röntgenuntersuchung während der letzteren Jahre für die Diagnose unsicherer Fälle von Perforationsperitonitis mehr und mehr zur Anwendung gekommen.

Die Röntgenbilder, die bei Vorhandensein einer kleineren oder grösseren Menge freien Gases entstehen, sind so wohlbekannt, dass sie hier ausser Acht gelassen werden können. Das freie Gas wird bekanntlich am leichtesten bei geeigneter Körperstellung in der subphrenischen Räumen beobachtet. Hier können jedoch auch bei anderen normalen oder krankhaften Zuständen negative Schatten beobachtet werden, die in gewissem Grade freien subphrenischen Gasblasen gleichen. Diese Zustände werden hier unten diskutiert werden. Zuerst aber wollen wir hier aus der Literatur und auf Grund eigener Beobachtungen einige Zustände zusammenstellen, wo freies Gas im Bauch angetroffen wird, ohne dass eine direkte Perforation vom Digestionstractus in die Bauchhöhle vorliegt. Diese Zustände sind natürlich oft von Gewicht sich zu erinnern, wenn es darauf ankommt, die praktisch wichtige Frage: Perforationsperitonitis oder nicht, zu entscheiden.

Bei Bauchoperationen gelangt oft Luft in die Bauchhöhle hinein und erhält sich daselbst bisweilen mehrere Wochen lang. Die Kenntnis dieses Umstandes ist von Bedeutung, wenn ein Patient kurz nachdem er eine Bauchoperation durchgemacht hat, z. B. wegen Bauchschmerzen zur Röntgenuntersuchung kommt. Dass Luft oft

im Bauchraum zurückbleibt, wenn er nach einer Eröffnung geschlossen wird, ist den Chirurgen wohl bekannt und einige Operateure suchen auch vor dem Knüpfen des letzten Fadens der Peritonealnaht diese Luft möglichst zu exprimieren (Stich u. a.), um die Bildung eines Emphysems der Bauchdecken zu vermeiden. Auch aus anderen Gründen ist dies, wie ich glaube, bisweilen indiziert, z. B. um eine Verschleppung von Keimen im Bauche durch die Gasblasen zu verhindern. *Es erscheint mir nämlich wohl denkbar, dass kleine Gasblasen, welche bei veränderter Körperstellung ihre Lage im Bauche ändern, auch dazu beitragen können Infektionsstoffe von einem Teil des Bauches in einen anderen zu verschleppen* und somit pathogene Mikroben z. B. in den subphrenischen Raum zu verbreiten. Eine solche Möglichkeit wird auch in gewissem Masse durch die Resultate beleuchtet, die Volkmann und Frommolt bei Tubendurchblasung erzielt haben. So beweisen die experimentellen Untersuchungen Volkmann's die Möglichkeit einer Verschleppung von Keimen durch den Pertubationsluftstrom. Frommolt pertubierte nach Installation von einigen Tropfen einer 2 %-igen Argochromlösung in die Uterushöhle und fand bei Eröffnung der Bauchhöhle beide Saktosalpingen bis zu ihrem äussersten Ende blau durchschimmernd.

Auf dem Röntgenkongress in Kopenhagen 1921 hat der Verf. Platten von 8 Fällen von postoperativem Pneumoperitoneum demonstriert; 6 dieser Fälle waren nach Operationen im oberen Teil und 2 nach Operationen im unteren Teil der Bauchhöhle entstanden. In der nächsten Zeit hatte der Verf. Gelegenheit weitere 10 solche Fälle zu untersuchen. Bei zweien derselben wurde das Gas erst nach ca. 3 Wochen resorbiert. Diese Untersuchungen wurden durch das grosse Entgegenkommen der Professoren G. Petrén und G. Nyström ermöglicht. Auf demselben Kongress wurde auch auf diese Fehlerquelle bei der röntgenologischen Diagnose der Perforationsperitonitis aufmerksam gemacht. Später haben Fritz und Popovic Beobachtungen über postoperatives Pneumoperitoneum vorgelegt. Auch früher sind ähnliche Beobachtungen von M. Cohn gemacht worden, doch waren mir dieselben unbekannt, als ich die oben erwähnten Untersuchungen anstellte und wurden auch in der Literatur nicht beachtet. In der Lehrbuch der Röntgenkunde von Rieder und Rosenthal (1924) erwähnt Haenisch, dass er in einem Fall einen Rest eines Pneumoperitoneum 4 Wochen nach Magenoperation gefunden hat.

Freies Gas kann nach einem früher mittels Tubendurchblasung oder Punktion angelegten Pneumoperitoneum oder nach einer Laparoskopie nach Jakobaeus zurückgeblieben sein.

Bei einer Pneumothoraxbehandlung kann es aus Versehen in die Bauchhöhle gekommen sein; mehrere solche Fälle sind in der Tu-

berkuloseliteratur mitgeteilt worden (Brauer, von Muralt, Zink, Cohn), und der Verf. hat ebenfalls Gelegenheit gehabt zwei solche Fälle zu sehen, bei denen der Versuch gemacht worden war einen linksseitigen Pneumothorax anzulegen. In der Regel ist in Zusammenhang mit solchen unglücklichen Zufällen keine Peritonitis entstanden.

Das Platzen einer subserösen Luftblase bei einem retroperitonealen interstitiellen Emphysem oder bei Pneumatosis cystoides intestinorum kann ebenfalls ein Pneumoperitoneum verursachen, wie der Fall Urbans von Pneumatosis intestinorum lehrt. Durch wiederholte Bauchpunktionen entleerte U. das freie, sich zurückbildende Gas der Bauchhöhle. Es zeigte sich bei einer der vorgenommenen Operationen Blasen von wechselnder Grösse, und am Mesenterium des Colon asc. und des Coecum fand sich sogar eine faustgrosse, subseröse, einkammerige Blase vor. Bisweilen kann ein interstitielles Emphysem in der Lunge oder im Mediastinum gegen die Regel sich in die Bauchhöhle ausbreiten, und auch bei Pneumoradiographie einer Niere kann ein ausgebreitetes subseröses Emphysem entstehen. Retroperitoneale Emphyseme sind z. B. bei Schussverletzung des Thorax beschrieben worden (Kempf, Sprengel); das Peritoneum erschien dabei durch ein grossblasiges Emphysem polsterartig abgehoben. Häufiger dürften sie bei retroperitonealen Perforationen des Kolon auf Grund eines Geschwürsprozesses oder nach einem Trauma entstehen. Lenk hat solche retroperitoneale Emphyseme nach Rektumschuss (3 Fälle) und bei Coecumschuss (1 Fall) beschrieben und hebt ausdrücklich hervor, dass es sich in seinen Fällen absolut nicht um eine durch Darmbakterien erzeugte Gasphlegmone des Zellgewebes handelte.

Lenk beobachtete einmal eine minimale subphrenische Gasblase nach Bauchschuss ohne Vorhandensein einer Magendarmperforation; Luft war seiner Ansicht nach durch das Projektil mitgerissen worden. Man könnte sich jedoch auch eine andere Möglichkeit des traumatischen Lufteintritts in die Bauchhöhle denken. In den obersten Teilen des Bauches herrscht nämlich im Stehen ein negativer Druck; werden im Stehen die Bauchdecken in ihrem obersten Teil oder die Brust im Gebiet des Sinus phrenicocostalis durchbohrt, und wird die Perforationsöffnung wenn auch nur eine minimale Weile offen stehen, wird also eine gewisse Menge Luft wegen des atmosphärischen Überdruckes in das Bauch hineingepresst. Die Lenk'sche Beobachtung ist von grossem Interesse, welche ihre Erklärung noch sei; sie zeigt, dass ein röntgenologisches *Erweisen freien Gases im Bauche kurz nach stattgefundener Bauchperforation nicht immer ein Zeichen einer Perforation gasführenden Magendarmteile ist.* In der Regel dürfte dies jedoch der Fall sein, besonders wenn eine grössere Gasmenge

angetroffen wird und die aussere Perforationsöffnung klein und geschlossen ist.

Einzelne in der älteren Literatur beschriebene, ätiologisch unklare Fälle von spontaner »Tympanitis peritonei» bei Kindern, welche Fälle infolge der starken Aufblähung des Bauches durch Gase sehr alarmierende Symptome zeigten, aber nach wiederholten Gaspunktionen zur Heilung kamen, deuten darauf hin, dass es unerforschte Wege für die Entstehung eines spontanen Pneumoperitoneums gibt. Eigentümliche Formen von Spannungspneumoperitoneum mit geruchlosem Gas im Bauche wurden auch nach operativen Eingriffen im unteren Teile des Bauches von Falkenburg, Fründ und Stegemann beobachtet und von Stegemann als Gasperitonitis beschrieben. In einigen von diesen Fällen war das Peritoneum glatt und glänzend.

Lenk erwähnt einen Fall von typischer subphrenischer Gasblase bei einem Lebersteckschuss, bei dem es im Laufe von wenigen Stunden zu einer Gasphlegmone der Leber mit Austritt von Gas in das Subphrenium durch das Leberloch kam.

Möglicherweise dürften subphrenische Gasabszesse und direkt an der Leberfläche liegende gashaltige Leberabszesse in den Fällen, wo kein deutliches Flüssigkeitsniveau erscheint, mit freiem Gase verwechselt werden können. Gashaltige Leberabszesse sind mehrmals beschrieben worden (Schenk, Lenk, Assmann u. a.) und Haenisch macht auf die Möglichkeit aufmerksam, dass ein sehr nahe der Oberfläche liegender, gashaltiger Leberabszess mit einem subphrenischen Abszess verwechselt werden kann.

Gas oberhalb eines Flüssigkeitsniveaus in einem subphrenischen Raum ist zwar beinahe immer Symptom eines abgekapselten subphrenischen Abszesses, dürfte aber sehr selten auch bei freier, nicht abgekapselter Perforationsperitonitis vorhanden sein können, wenn ein grosses Exsudat bald nach der Perforation entsteht oder schon vorher z. B. wegen einer Peritonitis carcinomatosa vorhanden war. Auf eine solche Möglichkeit deutet ein von Lorey beschriebener Fall von Aszites bei Leberzirrhose. Lorey beobachtete hier ein Röntgenbild wie bei einem doppelseitigen subphrenischen Gasabszess, nachdem eine probatorische Laparoskopie nach Jakobaeus vorgenommen worden war.

Hier soll der Vollständigkeit wegen daran erinnert werden, dass oft eine Interposition von gasgefüllten Därmen zwischen Zwerchfell und Leber vorkommt und bekanntlich ein Röntgenbild ergeben kann, das beim ersten Anblick eine gewisse Ähnlichkeit mit dem Bilde von freiem Gase in der Bauchhöhle hat. Meistens handelt es sich um eine Koloninterposition; seltener kommt Dünndarm in dem subphrenischen Raum zu liegen. Diese von Béclère, Chilaiditi, Perussia

und von manchen anderen beschriebenen Zustände von Hepatoptosis sind m. E. viel häufiger als aus der rel. geringen Anzahl publizierter Fälle hervorzugehen scheint. Der Verf. hat selbst mehr als 10 solche Fälle gesehen, von denen drei im Zusammenhang mit ähnlichen Fällen von Fischer und Edling in den Acta Radiologica (1922, s. 520) publiziert worden sind. Die Därme nehmen oft, ebenso wie freies Gas, nur in aufrechter Stellung diese Lage ein, die augenscheinlich u. a. auf dem geringen spezifischen Gewichte der gasgefüllten Därme beruht. Diese Därme lagern sich, soweit es ihre anatomische Befestigung zulässt, über die spezifisch schwereren Organe des Bauches.

Es ist von Interesse, dass auch Dünndarmschlingen, die von Pneumatosis cystoides intestinorum angegriffen waren, mitunter zwischen Zwerchfell und Leber angetroffen wurden (Barjon und Dupasquier, Moreau, ferner wahrscheinlich in einem Falle, der von Bonnamour, Cotte, Badolle und Delore beschrieben wurde). Was den letzteren Fall von Pneumatosis betrifft, so glaubte jedoch der Operateur Cotte, dass das radiologische Bild einer klaren Zone im subphrenischen Raume von freiem Gas in der Bauchhöhle herrührte. Wie Moreau gezeigt hat, ergibt die Pneumatosis intestinorum mit ihren zahlreichen, meistens beisammenliegenden Gasblasen von wechselnder Grösse ein charakteristisches Röntgenbild, welches eine Diagnose ermöglichen kann, wenn man nur an diese Erkrankung denkt. Nicht nur die Gasblasen in den Dünndarmwänden bei Pneumatosis, sondern auch Gasanhäufungen im Lumen dieser Därme können einmal zur Verlagerung der erkrankten Schlingen in den subphrenischen Raum führen. Die interstitiellen Blasen verursachen nämlich zuweilen Darmstenosen und Ileuszustände (siehe Naeslund), die bekanntlich oft von intestinalen Gasansammlungen gefolgt sind. Wenn die Peritonealflüssigkeit sich vermehrt, was bei diesen Erkrankungen ab und zu beobachtet worden ist (siehe die Zusammenstellung Naeslunds), so wird in aufrechter Stellung ein Emporsteigen der von Pneumatosis ergriffenen Schlingen über die Leber noch mehr erleichtert, vorausgesetzt dass sie ein hinreichend langes Mesenterium haben.

In einzelnen Fällen finden sich bei der Pneumatosis auch subseröse Blasen auf der Unterseite des Zwerchfells; wenn mehrere kleine solche Blasen beisammenliegen oder wenn isolierte Blasen eine gewisse Grösse erreicht haben, so können sie beim ersten Anblick zur Verwechslung mit freiem Gas in der Bauchhöhle Veranlassung geben. Eine solche subphrenische Lokalisation der Blasen ist von Jaboulay, Vallas, Pinatelle und Dieterich beschrieben worden.

Freies Gas lässt sich wie bekannt in aufrechter Körperstellung sehr leicht in Form von Gasblasen unter dem Zwerchfell an der rechten Seite oder an beiden Seiten nachweisen. *Wenn der Patient*

schwach ist, kann die Untersuchung ebensogut und mit weniger Unannehmlichkeiten für den Patienten ausgeführt werden, ohne dass er aus dem Bette gehoben zu werden braucht: er wird nur vorsichtig in die linke Seitenlage gebracht. Das Gas sammelt sich dann in der rechten Flanke zwischen dem Zwerchfell und der Leber an und kann bei wagrechter Strahlenrichtung leicht nachgewiesen werden. Es kann auch bisweilen von Wert sein die rechte Seitenlage einnehmen zu lassen. Die Rückenlage, die von LEVY-DORN in einem Falle verwendet worden ist, ist in der Regel nicht so zweckmässig, weil kleine Gasmengen dabei nicht nachgewiesen werden können. Dagegen kann bei horizontaler Strahlenrichtung auch eine sehr kleine Menge freien Gases nachgewiesen werden, und die Untersuchung lässt sich schnell ausführen. Eine einfache Durchleuchtung während einiger Sekunden

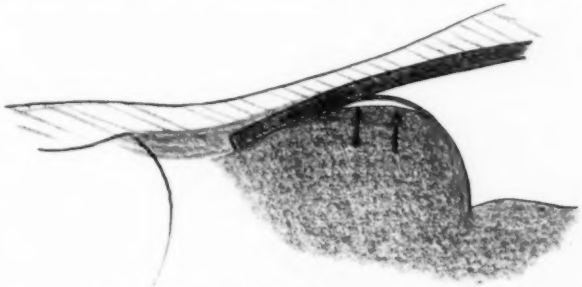

Fig. 1. Die Lage und das Aussehen einer kleinen freien Gasblase im Bauche in linker Seitenlage und bei horisontaler Strahlenrichtung.

kann genügen. Infolge dessen muss die gewöhnliche Ansicht bestritten werden, dass der Allgemeinzustand der Kranken diese Untersuchungsmethode in den meisten Fällen verbieten wird (BRÜTT). Da diese Röntgenmethode für den Nachweis des freien Gases auch empfindlicher und zuverlässiger ist als die Perkussion, so ist sie also in klinisch ungewissen Fällen in hohem Grade zu empfehlen.

Als ein typisches Beispiel für das Aussehen und die Lagerung der freien Gasblase bei Perforationsperitonitis bei Untersuchung in linker Seitenlage dürfte folgender Fall angeführt werden können.

Journalnr. Chir. B 100/1922 Axel, 70 J. *Ulcus ventriculi perforans et Peritonitis acuta diffusa.*

Erkrankte am 7. Febr. um halb acht mit sehr heftigen Bauchschmerzen. Der Bauch bretthart gespannt. Das Allgemeinbefinden stark beeinflusst.

Röntgenuntersuchung zwei Stunden später in linker Seitenlage. Der Pat. wurde nicht aus dem Bette gehoben. Eine kleine subphrenische Gassichel erscheint in der rechten Flanke (Fig. 1). Plattennr. C 2087. Die Zwerchfellkuppel bewegen sich ziemlich gut.

Der Mangel an freiem Gas im Bauche schliesst natürlich eine Perforation des Magendarmkanals nicht aus; bisweilen ist trotz einer Perforation kein intraperitoneales Gas vorhanden und bisweilen liegt eine Abkapselung vor. Dünndarmsperforationen verlaufen bekanntlich oft ohne, Magen- und Kolonperforationen dagegen in der Regel mit Austritt von freiem Gas in die Bauchhöhle. VAUGHAN und BRAMS fanden bei Ulkusperforation in 13 von 15 Fällen freies Gas. Seit d. J. 1921 sind an dem hiesigen Akademischen Krankenhause 9 Perforationsperitonitiden auf Grund des Vorhandenseins von freiem Gase in der Bauchhöhle röntgenologisch diagnostiziert worden. Von diesen Fällen waren 8 Ulcus ventriculi perforans und 1 Fall ein Schuss durch das Coecum. In allen Fällen von Ulcus ventriculi perforans, die zu Röntgenuntersuchung gesandt wurden, war freies Gas im Bauch vorhanden, wenigstens insofern ich mich erinneren kann. Im übrigen wurden mehrere akute Bauchfälle im Bezuge auf freiem Gase mit negativem Resultat untersucht; es waren Fälle von perforiertem Appendix, geplatzter Ovarialzyste und akuter Cholezystitis.

Das Symptom der subphrenischen Gasblase ist nach LENK und HOLM u. a. in gewissen Fällen bei der Differentialdiagnose zwischen perforiertem Appendix oder Gallenblase bzw. Ulcus perforans verwertbar. Wenn die Differentialdiagnose hauptsächlich zwischen diesen Erkrankungen steht, dürfte ein positiver Fund freien Gases grössere Bedeutung für die Diagnose haben als ein negativer Fund, indem freies Gas recht bestimmt auf Ulcus deutet, sein Fehlen aber nicht gleich bestimmt Ulcus widerspricht. Auch bei perforiertem Appendix dürfte in seltenen Fällen freies Gas im Bauch vorhanden sein können, sei es, dass Gase von den bei Appendizitis oft stark geblähten proximalen Kolonteilen in die Bauchhöhle entweicht haben, sei es, dass anaerobe Darmbakterien schon freies Gas in ersichtlicher Menge dort gebildet haben. G. PETRÉN und andere heben jedoch hervor, dass freies Gas bei der Laparotomie einer Peritonitis im frühen Stadium beinahe nur bei Ulcus perforans angetroffen wird, und dass sein Vorkommen in einem Peritonitisfall unsicheren Ursprungs also einen bestimmten Fingerzeig betreffs des Ausgangspunktes gibt.

In meinen Fällen, wo freies Gas als Zeichen einer Perforationsperitonitis röntgenologisch erwiesen werden konnte, war in der Regel auch klinisch diese Diagnose gestellt worden; in ein paar Fällen aber war die Diagnose vor der Röntgenuntersuchung unsicher. Es scheint also ganz klar zu sein, dass eine Röntgenuntersuchung in gewissen unklaren Bauchfällen von grossem diagnostischen Werte ist. Dass diese diagnostischen Möglichkeiten mehr und mehr ausgenützt werden, geht schon aus der grossen Anzahl von Aufsätzen und Beiträgen über dieses Thema hervor, die insbesonders während

der letzten Jahre publiziert worden sind (LEVY-DORN, LENK, MEYER-BETZ, ASSMANN, SCHOTTMÜLLER, DAHM, GRASHEY, STEGEMANN, COPHER, VAUGHAN, BRAMS, WESSLER, BANCROFT, DANDY, JACHES, WEILAND, WEIL, KENÉZ, POPPER, ROSENTHAL, HAUDEK, BAGER, HOLM u. a.).

Wenn ein Patient mit akuter Perforationsperitonitis zur Röntgenuntersuchung kommt, so kann das Zwerchfell, wie ich ein paarmal gesehen habe, im grossen und ganzen normale Verhältnisse zeigen; der Patient will jedoch nur ungern tief atmen wegen der Schmerzen und des Unbehagens, die damit verbunden sind. In solchen Fällen kann also die freie Gasblase das einzige auffällige Röntgensymptom sein. In anderen Fällen dagegen zeigt das Zwerchfell eine deutlich verringerte Verschieblichkeit und später, wenn ausgesprochener Meteorismus aufgetreten ist, auch einen abnormen Hochstand. Gleichzeitig kann man ein kleines Pleuraexsudat an der einen oder an beiden Seiten finden. Bei Hinzutreten eines paralytischen Ileus können die vom Verf. anderwärts beschriebenen Zeichen eines kleinen oder mässigen Bauchergusses entstehen.

ZUSAMMENFASSUNG

Der Röntgenologische Nachweis von freiem Gas in der Bauchhöhle kann wie bekannt eine wertvolle Stütze für die Diagnose einer Perforationsperitonitis sein, die durch Perforation von gashaltigen Magen-Darmteilen entstanden ist. Es kann jedoch freies Gas in der Bauchhöhle auch bei anderen Gelegenheiten auftreten, so dass die R-Diagnose einer Perforationsperitonitis nach der Feststellung von freiem Gase auch auf Anamnese, klinische Data und andere Röntgensymptome bauen muss.

Freies Gas kann während der nächsten Wochen nach einer Bauchoperation, ebenso nach einer Laparoskopie und einem früher angelegten Pneumoperitoneum angetroffen werden; das letztere kann ein absichtliches oder ein unabsichtliches gewesen sein (entstanden bei dem Versuche der Anlegung eines Pneumothorax).

Freies Gas kann auch die Folge des Berstens einer Gasblase bei Pneumatosis cystoides intestinorum und möglicherweise auch nach Berstung von interstitiellen subserösen Blasen von anderer Ätiologie entstehen.

Freies Gas in grossen Mengen kann nach STEGEMANN durch Einwirkung von gasbildenden Bakterien auftreten, auch wenn das Peritoneum nur innerhalb eines kleinen, begrenzten Gebietes eine entzündliche Reizung zeigt. Es kann auch bei einem Lebersteckschuss vorkommen, der zu Gasabszess oder zu Gasphlegmone in der Leber Veranlassung gegeben hat (LENK).

Zwischen Diaphragma und Hepar interponierte Därme (v. a. das Kolon) können bei flüchtiger Untersuchung zu Verwechslung mit freiem Gase Veranlassung geben. Nicht bloss wenn ein Darmlumen in abnormer Weise durch Gas ausgedehnt ist, sondern auch wenn intramurale Gasblasen vorhanden sind, wie bei Pneumatosis cystoides intestinorum, kann eine solche Interposition entstehen. Auch subseröse Blasen unter dem Diaphragma, wo solche Blasen in seltenen Fällen bei Pneumatosis beobachtet wurden, können zu Verwechs-

lungen Veranlassung geben. Man muss auch an subdiaphragmatische, interstitielle Emphysemblasen anderer Genese sowie an ausgebreitete retroperitoneale Gasphlegmonen denken, die bis an die untere Fläche des Diaphragmas reichen.

Man kann sich fragen, ob nicht kleine Luftblasen, die bei Operationen in der Bauchhöhle zurückgeblieben oder bei Perforationen dorthin gekommen sind, in gewissen Fällen zur Verbreitung von Mikroben in der Bauchhöhle, z. B. in die subphrenischen Räume, Veranlassung geben können, wenn die Blasen bei Änderung der Körperstellung von einem Platze zum anderen wandern.

Bei diffuser Peritonitis mit freiem Gase kann oft eine Anzahl von R-Symptomen entstehen, wie Nachschleppen des Diaphragmas, eine sekundäre Pleuritis — oft nur minimal, aber dessen ungeachtet ein wichtiges Symptom — Ileusbilder und R-Symptome eines kleinen Exudates in der Bauchhöhle.

Die R-Untersuchung auf freies Gas kann sehr schonend und rasch ausgeführt werden. Man braucht den Pat. in seinem Bette nur auf die eine Seite (wenn möglich die linke) zu drehen und zu durchleuchten oder eine Platte von dem am höchsten liegenden Teil des Bauches mit horizontaler Strahlenrichtung aufzunehmen.

SUMMARY

The roentgenological proof of free gas in the abdominal cavity may, as is well known, be a valuable support to the diagnosis of peritonitis, due to perforation of a gas-containing part of the stomach or intestines. But free gas can also occur in the abdominal cavity in consequence of other conditions, so that the roentgen diagnosis of a perforating peritonitis after the establishment of free gas must also be built on the anamnesis, clinical data and other roentgen signs.

Free gas can also be met with during the weeks immediately following an abdominal operation, and also, after a laparoscopy and a previously applied pneumoperitoneum: this last may have been an intentional or an unintentional one (arisen in the attempt to apply a pneumothorax).

Free gas can also arise as the consequence of the bursting of a gasbubble in Pneumatosis cystoides intestinorum and possibly also after the bursting of interstitial subserous bubbles of other etiology.

Free gas in large amounts can, according to STEGEMANN, occur through the influence of gas-forming bacteria, and also when the peritoneum shows an inflammatory irritation of a small and limited area. It may also occur when a gunshot has lodged in the liver, which has given rise to a gasabcess or a gasphlegmone (LENK).

Intestines lying between the diaphragm and the liver (including the colon) may lead to confusion with free gas on a superficial examination. Such an interposition may arise not only when some part of the gut is abnormally distended with gas, but also when there are intramural gasbubbles, as in cases of Pneumatosis cystoides intestinorum. Moreover subserous bubbles below the diaphragm, where such bubbles have been observed in rare cases of Pneumatosis, may give rise to confusion. We must also think of subdiaphragmatic interstitial emphysemal bubbles of other origin and of retroperitoneal gasphlegmones which reach as far as the under-surface of the diaphragm.

One may ask oneself whether occasional small air-bubbles remaining in the abdominal cavity after an operation, or having reached there in connection with perforation, may not cause the spread of the microbes in the abdominal cavity, for instance in the sub-phrenic cavity, through the bubbles moving from one place to another when the position of the body is changed.

In diffuse peritonitis with free gas a number of roentgenological observations may be made such as diminnished movement of the diaphragm, a secondary pleuritis — often only very slight, but none the less an important sign — intestinal obstruction and signs of a slight exudation in the abdominal cavity.

The roentgen examination of free gas can be carried out quickly and with little pain. It is only necessary to turn the patient lying in his bed on to one side (if possible, the left) and to transilluminate or to take a plate of the highest part of the abdomen with the rays horizontal.

RÉSUMÉ

La constatation radiologique de la présence de gaz libres dans la cavité abdominale peut, comme on le sait, être un précieux élément dans le diagnostic d'une péritonite due à la perforation d'un estomac ou d'un intestin contenant des gaz. Toutefois, cette présence de gaz libres dans la cavité abdominale peut être due à d'autres causes, en sorte que le diagnostic radiologique d'une péritonite par perforation basé sur la présence de gaz libres dans la cavité abdominale, doit également s'appuyer sur des données anamnestiques ou cliniques ainsi que sur d'autres signes radiologiques.

On peut observer la présence de gaz libres au cours des semaines qui suivent une intervention abdominale, ou après une laparotomie exploratrice, ou encore postérieurement à l'établissement d'un »pneumopéritonéum»; celui-ci peut d'ailleurs avoir été volontaire ou involontaire (notamment au cours des tentatives d'établissement d'un pneumothorax).

La formation de gaz libres peut également être due à la rupture d'une bulle gazeuse dans la pneumatose cystoïde de l'intestin, et peut être aussi à la rupture d'une bulle sous-séreuse d'éthiologie différente.

D'après STEGEMANN, on pourrait également observer une formation abondante de gaz libres sous l'action de certaines bactéries gazogènes, même dans des cas où l'on n'observe du côté péritonéal qu'une irritation inflammatoire restreinte et limitée à un territoire peu étendu. Il peut en être de même dans les plaies pénétrantes du foie ayant déterminé l'apparition d'abcès ou de phlegmons gazeux (LENK).

Des anses intestinales (et notamment le côlon) interposées entre le diaphragme et le foie peuvent, à un examen superficiel, en imposer pour une collection de gaz libres. Une interposition de ce genre peut se produire, non seulement lorsque la lumière de l'intestin est anormalement distendue par des gaz, mais aussi lorsqu'il existe des bulles intrapariétales comme dans la pneumatose cystoïde des intestins. Des bulles sous-séreuses, situées au-dessous du diaphragme, comme on en a observé dans quelques rares cas de pneumatose, peuvent également donner le change. Il faut également penser à des bulles emphysémateuses subdiaphragmatiques d'éthiologie différente ainsi qu'à des phlegmons gazeux rétropéritonéaux étendus, atteignant la face inférieure du diaphragme.

On peut également se demander si de petites bulles d'air, reliquats d'operations abdominales, ou ayant pénétré dans la cavité abdominale par perfora-

tion, ne peuvent pas dans certains cas provoquer une prolifération microbienne dans l'abdomen, lorsque, à la suite de changements d'attitude du malade ces bulles deviennent l'objet de migrations.

La péritonite diffuse avec formation de gaz libres peut souvent donner naissance à un certain nombre de signes radiologiques tels que relachement du diaphragme, pleurite secondaire — souvent très légère mais constituant néanmoins un symptôme important —, signes d'iléus et signes radiologiques d'exsudation péritonéale légère.

L'examen radiographique dans les cas de gaz libres peut être pratiqué rapidement et sans gêner le malade; il suffit de le mettre dans son lit en décubitus latéral (gauche de préférence) et de pratiquer la radioscopie ou de prendre une plaque par irradiation horizontale des parties les plus élevées de la cavité abdominale.

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FROM THE ROENTGEN DEPARTMENT OF THE BISPEBJERG HOSPITAL, COPENHAGEN, CHIEF: CHRISTIAN I. BAASTRUP

X-RAY EXAMINATION AND TREATMENT IN A CASE OF PSAMMOUS, PERITONEAL PAPILLOMA

by

Chr. I. Baastrup and *Ejnar Nielsen*

By the word *psammoma*, originally coined by VIRCHOW, we understand a tumor containing calcareous concretions of a concentric structure. The word is not used to denote any particular type of tumor; benign and malignant tumors alike can be psammous; there are psammofibromata and psammosarcomata as well as psammocarcinomata.

On the whole, psammomata are rather rare formations. They occur usually in the cerebral or medullary meninges, but now and then tumors of a psammous nature are found in the *ovaries*, especially in the form of papillary cystadenomata and cystocarcinomata (RICHARD H. MILLER, ROSSEL and CURT KOCK), in the *uterus* (STIDA, SCHMIDT and SCHUETSE), in the *thyroid gland* (LANGHANS) and in the *mamma* (ACKERMANN, FLAICHLEN, OLIVIER, LUECKE and BELFRAGE).

The case of psammoma which forms the subject of the present communication presents a number of interesting features. Its location was in the peritoneum, and it was subjected to treatment by the Roentgen-rays.

The patient, a female enamel worker, aged 38, was admitted into the Bispebjerg hospital, Dep't A, on September 14th, 1921, for a "fibroma uteri". Before that time, her health had always been good, and her menses natural with the exception of their interruption once, by an abortion, eight years ago. She complains of difficult micturition and of obstipation. WASSERMANN: negative. No gonococci. Rectovaginal exploration: the uterus is displaced in an upward direction, toward the symphysis, by a somewhat irregularly shaped tumor about as large as the head of a child.

October 17th, 1921. — Laparotomy, with extirpation of a hematocele, and double salpingectomy (Assistant Surgeon, Dr EIKEN). The pelvis minor is found completely filled with an intumescence containing atheromatous masses and a certain quantity of thin, old blood (hematocele); similar masses, but smaller, are found on the uterus, the ovaries and the intestines. As much as possible of these pultaceous masses is removed; still, a portion of the hematocelic wall remains.

Microscopy of both salpinges and of the hematocelic wall (Prof. ELLERMANN): The structure of the envelope is complex. It shows remnants of cells imbedded in a coarse mesh-work of connective tissue: inward from these cellular masses there is a papillary structure, through which are running very

delicate stromal bands covered on both sides with largely interspaced, narrow cells of medium height. — In this way there are formed: partly papillæ, partly a network, and partly almost solid masses of cells. Also, there are found in all parts of the tumor — as well in the coarser stromal portions and to a lesser extent, in the cellular masses — numerous large, round bodies of rather uniform appearance, many of them concentric in structure. These stain blue with hematoxylin.

The tubes look normal, except for the incipient formation of a few psammomata here and there in the serous membrane.

Nov. 17, 1921. — The patient is discharged. There is still a wound, about 3/4 of an inch in diameter, from the operation; and by rectovaginal exploration a large intumescence — which is not painful on pressure, however — is felt between the uterus and the rectum.

Jan. 14, 1922. — The patient is again admitted; this time for a "fistula abdominis".

Jan. 16, 1922. — Radiography (CHR. BAASTRUP): In the posterior sloping portion of the pelvis there are observed some faintly defined, irregular shadows, of which it is noticed that under different projection they appear in a different relation to the sacrum. This indicates that they must be lying in another plane than the latter, and inasmuch as the idea of intestinal shadows may safely be dismissed, the shadows here observed must be due to calcareous bodies, probably in some tumor.

Jan. 26. — Exploratory laparotomy with extirpation of the uterus (CARL WESSEL, Senior Surgeon): The uterus is found to be somewhat large, and the two ovaries large. These organs, together with the adjoining omentum and intestine, lie imbedded in a peculiar mass of coarsely granulated material of seemingly inflammatory origin. No free or foreign body is either felt or observed.

Microscopy of tissue from the peritoneum (Prof. ELLERMANN): It consists partly of connective tissue, partly of rather faintly coloured masses of epithelium. In all parts of the tissue there are numerous concentric bodies, fairly uniform as to size, and which become a vivid blue when stained with hematoxylin. (Fig. 1.)

March 22. — The patient is discharged. Her temperature had been normal, except during the period immediately following each operation.

May 1, 1923. — The patient is once more admitted, for recurrence of the psammoma. — She had been feeling fairly well for the first five months after her last discharge, but has since then been suffering, in steadily increasing degree, from pains in the lower part of the abdomen. — Objectively, her appearance is healthy. There can be perceived the presence, in the lower part of the abdomen, of multiple tumors of various sizes, a few lumps being as large as the head of a child. — Rectovaginal exploration: The neck of the uterus continues in an elastic, lumpy tumor, which fills the greater part of the pelvis, extending upwards almost to the level of the umbilicus and almost impossible to displace. — She complains of pains in defecation.

Roentgen treatment was then applied, during the period between May 12 and May 30, 1923; the following doses being given:

5 S.-N. through 1/2 mm. zinc + 1 mm. al.; dist. 46 cm. (front), large field;
4 » » 1/2 mm. » + 1 mm. » ; » 46 cm. (back), » »

May 30. — The patient is discharged.

June 27. — Note: Tumor decreased in size; patient is feeling comfortable.

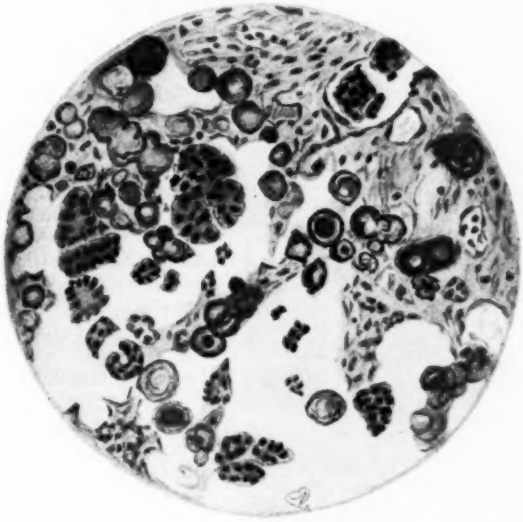

Fig. 1.

Sept. 7. — The patient states that for several years she has not been feeling so well as at present. No trouble in defecation. Tumors can be distinctly felt, but they are smaller than before. Between Sept. 10 and Oct. 3, 1923, the following X-ray doses are given:

4½ S.-N. through ½ mm. zinc + 1 mm. al.; dist. 46 cm. (front), large field;
4 » » ½ mm. » + 1 mm. » ; » 46 cm. (back), » »

Nov. 11. — The patient is feeling well. She can now lie on her side, something which she has not been able to do for the last four or five years. The tumors can no longer be felt by palpating the abdomen.

Dec. 28, 1923; Jan. 18, and Feb. 22, 1924. — Notes: Complete well-being; no tumors perceptible to palpation of the abdomen.

Rectovaginal exploration (Ass.-Surgeon Sv. Hansen): The neck of the uterus continues in a tumor about the size of a fist. This tumor lies slightly curved backwards, as if it were a retroflexed corpus, of which it has exactly the consistency, also. It is remarkably mobile and absolutely indolent. To the right, in the pelvis, there can be felt an independent, round, smooth, indolent tumor the size of a small orange.

Febr. 5. — Radiography (Chr. Baastrup): In the upper part of the pelvis there is observed a shadow, between 12 and 13 cm. wide, sharply contoured at its base, rounded off on the sides and losing itself diffusely upwards. The density of this shadow is fairly even throughout; still, here and there, areas a little more transradiant are seen, and "islands" of a slightly denser shading. No indication of structures, nor any very heavily shaded patches anywhere. — Below this shadow is seen a cloudy blur, about 3 by ¾ cm. large; and up underneath the right sacroiliac symphysis there is a patch, 1 by 1 cm.

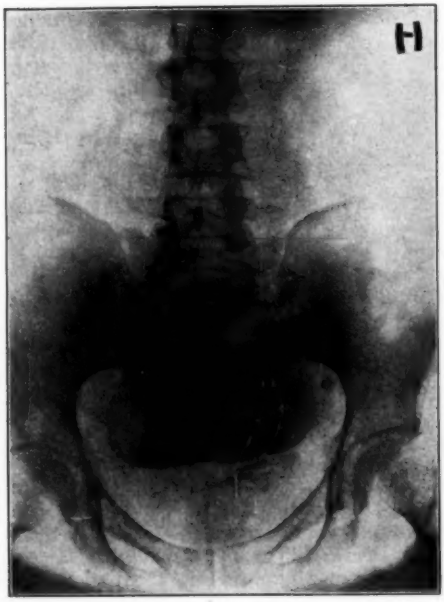

Fig. 2.

large and very regular of outline. (Fig. 2.)

The shadowy elements observed in the course of this last investigation were far more intense than those revealed by the former Roentgen examination. This is very likely due to the fact that the calcareous bodies contained in the large tumors — of which bodies it is almost certain that they could not be influenced by the irradiation — have become gathered together much more densely, within certain circumscribed areas, than before the tumors had been reduced as a result of the Roentgen treatment.

Febr. 25. — Note: Complete well-being. The patient has gained 25 kilos in weight since the Roentgen treatment was begun.

The illustrations of psammomata found in the literature [1]) show a great variation in the psammous formations, both as regards their shape, their structure and the manner of their disposition. In some cases we see round, concentrically built up calcareous bodies lying about separately; in others we find these calcareous formations — but not of concentric structure — assembled in heaps ressembling clusters of grapes. WALDEYER [2]) and ACKERMANN [3]) have mentioned these differences, in connection, respectively, with a case of papilloma ovarii and a case of carcinoma mammæ; and WALDEYER even held that the two cases examined by ACKERMANN and himself were not psammomata at all, but formations of an entirely different character and origin, namely, the result of calcareous precipitation to the outside of tumorous growths undergoing a hyaline degeneration.

It would seem that, of the psammous formations mentioned above, the former kind is found chiefly in tumors composed of *long, narrow cells set closely together* (sarcomata, fibromata and some endotheliomata), while the last named form occurs more generally in tumors composed of *broad, separate cells of medium height* (papillomata and cystomata).

[1]) Zeitschr. f. Geburtshilfe u. Gynækologie, vol. VI, plates XIV and XV. Virchows Archiv, vol. XLV, plate III.
BORST: Die Lehre der Geschwülsten, 1902, plates XI and XII.
[2]) WALDEYER: Archiv f. Gynækologie, vol. I.
[3]) ACKERMANN: Virchows Archiv, vol. XLV.

The case which forms the subject of the present communication must be classed as belonging rather to the former of the two groups, inasmuch a number of the psammous formations which it contained were found to be of a concentric structure.

The large, twice recurred tumor reacted very strongly and thoroughly to the Roentgen treatment, though — owing to the relatively short period of observation, so far — it is of course impossible, yet, to make any final, definite prognosis. An explanation of its great sensibility to the rays may possibly be found in its highly calciferous nature, inasmuch as the calcareous elements may well be supposed to occasion a particularly abundant development of secondary rays. We have not been able to find, in the literature at our disposal, any previous reference to Roentgen examination, or Roentgen treatment, of psammomata.

SUMMARY. A description — probably the first one in medical literature — is given on the examination and treatment by the Roentgen of a psammoma in the peritoneum (genitalia feminina interna). The case is particularly interesting because the Roentgen treatment had a most markedly beneficient effect as regards the tumor, which had already recurred very violently twice in spite of having previously operated on, also twice, — the first time in connection with a salpingectomy, the second time with extirpation of the uterus.

It is supposed that the remarkably fine result of the Roentgen treatment must be ascribed to the calcareous nature of the psammous elements, whose presence has presumably given rise to abundant and appropriate secondary rays.

ZUSAMMENFASSUNG. Die Verff. geben eine Beschreibung — wahrscheinlich die erste in der medizinischen Literatur — über die röntgenologische Untersuchung und Behandlung eines Psammoms im Peritoneum (Genitalia feminina interna). Der Fall ist besonders interessant, weil die Röntgenbehandlung eine ausserordentlich ausgesprochen günstige Einwirkung auf den Tumor hatte, der bereits zweimal sehr heftig rezidiviert war, obzwar er vorher, auch zweimal, operativ entfernt worden war, das erste Mal im Zusammenhang mit einer Salpingektomie, das zweite Mal mit Exstirpation des Uterus.

Es wird angenommen, dass das bemerkenswert gute Resultat der Röntgenbehandlung der kalkigen Natur der psammösen Elemente zuzuschreiben ist, deren Gegenwart vermutlich reichliche und wirksame sekundäre Strahlen hervorrief.

RÉSUMÉ. Les auteurs donnent une description — probablement la première dans la littérature — de l'examen et du traitement radiographique d'un psammome du péritoine (organes génitaux internes de la femme). L'observation présente un intérêt particulier du fait que le traitement radiographique eut un effet remarquablement favorable sur une tumeur qui avait déjà deux fois été le siège d'une récidive violente à l'occasion de deux opérations préventives successivement tentées, savoir, la première fois une salpingectomie et la seconde une hystérectomie.

On peut supposer que le résultat remarquable dû au traitement radiologique tient à la nature calcaire de la tumeur qui a déterminé la formation de rayons secondaires abondants et d'un heureux effet.

AUS DEM RÖNTGENABTEILUNG DES K. SERAFIMERLAS., STOCKHOLM
CHEF PROF. G. FORSSELL

EINE VERBESSERUNG DES FORSSELL'SCHEN DURCHLEUCHTUNGSSTATIVS

von

Erik Lysholm
(Erster Assistent)

Bisher war es beim FORSSELL'schen Durchleuchtungsstativ nicht möglich, die Röntgenröhre um eine horizontale Achse zu drehen, um z. B. bei Durchleuchtungen des Thorax eine Strahlenrichtung schief von obenabwärts, bzw. von unten—aufwärts erzielen zu können. Dies ist sehr wichtig beim Studium des vorderen und hinteren Teiles des Sinus phrenico-costalis, ferner von interlobären Verdichtungen in der Lunge und schliesslich bei Untersuchungen der Lungenspitzen und der Cardia in stehender Stellung.

Ich habe zu diesem Zwecke folgende Vorrichtung konstruiert; die mechanischen Einzelheiten hat Ingenieur H. BAUDOU ausgearbeitet. (Fig. 1 u. 2.)

Die Röntgenröhre ist in einer zylindrischen Haube aus Bariumporzellan eingeschlossen (s. die Verhandlungen des Skandinavischen Radiologenkongresses, Stockholm 1922, Acta Radiologica, Bd. III, H. 3, S. 249). Die Röntgenröhre wird mittels eines Schlitten in die Schutzhaube eingeschoben, welche die Form eines Zylinders hat, dessen beide Enden mit 4 mm dickem Bleigummi lichtdicht verschlossen werden.

Die Schutzhaube ist in einer Kardanähnlichen Vorrichtung so befestigt, dass sie sich mittels des Schraubenarmes auch in horizontaler Richtung drehen lässt; der Schraubenarm wirkt auf ein Schneckenrad und ist selbstarretierend, d. h. die Röhre verbleibt in dem Winkel, in den man sie gedreht hat. Befindet sich die Röhre in Mittellage, so schnappt eine kleine Feder ein; hierdurch wird der Untersucher immer darauf aufmerksam gemacht, dass die Röhre — beispielsweise nach einer Durchleuchtung in schiefer Richtung — wieder auf dem Punkte angelangt ist, an dem sie im Verhältnis zum Schirme senkrecht zentriert ist.

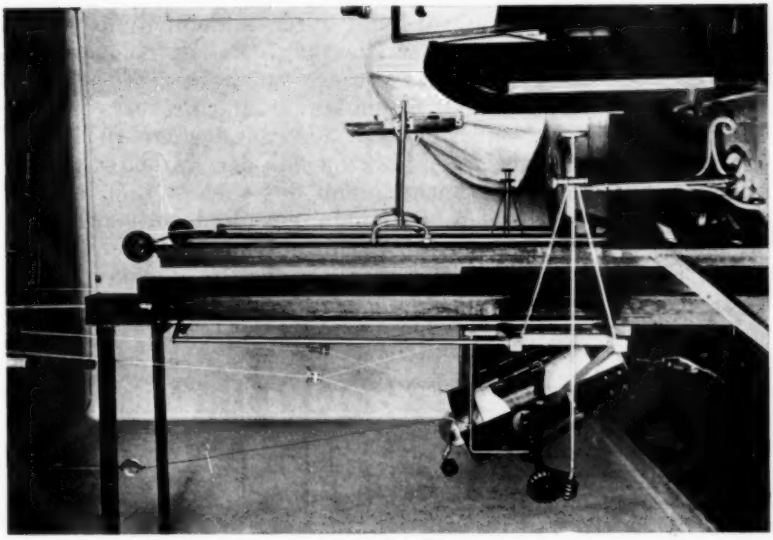

Fig. 2.

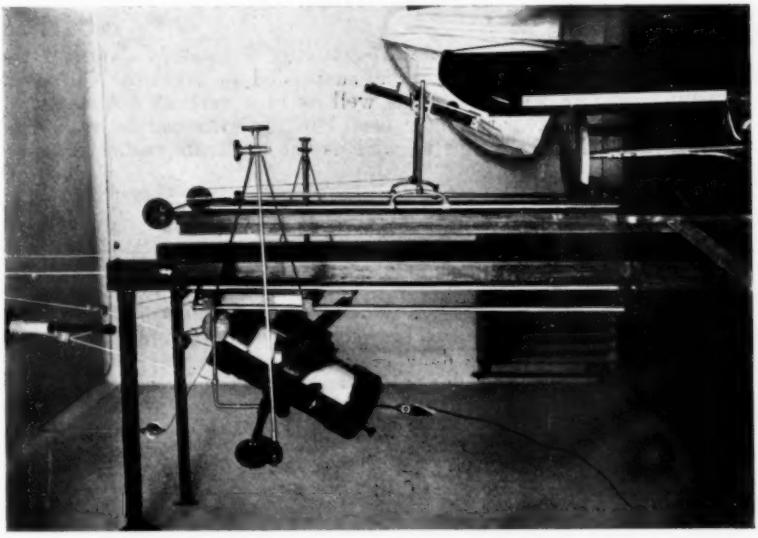

Fig. 1.

Dadurch, dass man den Arm vor- und zurückschiebt, dreht sich die Röhre um ihre Achse in vertikaler Richtung. Bei Durchleuchtungen braucht man demnach nicht den Patienten zu drehen, um sich eine Ansicht darüber bilden zu können, ob ein krankhafter Prozess vorne oder hinten in der Lunge liegt, sondern man braucht nur den Arm zu bewegen. Bei Einstellung in schiefen Lagen braucht man den Patienten nicht so viel zu drehen. Man kann leicht genau das schiefe Bild erhalten, das man wünscht, ohne den Patienten vor- und zurückzudrehen. Namentlich bei der Einstellung für Freiprojektion der Aorta descendens (nach FRIK) kann man aus dieser Variationsmöglichkeit grossen Nutzen ziehen.

ZUSAMMENFASSUNG

Verfasser beschreibt eine Verbesserung des FORSSELL'schen Durchleuchtungsstativs, bei der die Röntgenröhre in einer Kardanähnlichen Vorrichtung aufgehängt ist und sowohl horizontal als vertikal drehbar ist. Wichtig bei der Untersuchung interlobärer Prozesse im Thorax sowie im vorderen und hinteren Teile des Sinus.

SUMMARY

The author describes a valuable alteration of FORSSELL's stand for transillumination by which the X-ray tube, suspended in a gimbal-like manner, can be freely moved in a horizontal as well as in a vertical direction.

It has proved itself particulary useful in the examination of interlobar thoracic conditions of the anterior as well as the posterior mediastinum.

RÉSUMÉ

L'auteur décrit une amélioration du pied à diascopie de FORSSELL, consistant en la suspension de l'ampoule au moyen d'un dispositif à la cardan, ce pui permet un déplacement aussi bien vertical qu'horizontal. Ce dispositif rend surtout de grands services dans l'examen des processus interlibaires du thorax ainsi que dans l'examen des parties antérieures et postérieures du sinus.

PROCEEDINGS

OF THE

NORDISK FÖRENING FÖR MEDICINSK RADIOLOGI

AN ACCOUNT OF THE FOURTH MEETING OF THE SOCIETY,

HELSINGFORS,

SEPTEMBER 1ST AND 2ND 1925

President: G. A. WETTERSTRAND, *M. D.*
Secretary General: C. G. JANSSON, *M. D.*
Honorary Chairmen: G. FORSSELL, *M. D.*; A. REYN, *M. D.*; H. J. PANNER, *M. D.*; S. A. HEYERDAHL, *M. D.*
Secretaries: Å. ÅKERLUND, *M. D.*; CHR. I. BAASTRUP, *M. D.*; N EMELEUS, *M. D.*; A. W. SCHIANDER, *M. D.*

Minutes of the Fourth Ordinary Meeting of the Nordisk Förening för Medicinsk Radiologi;

Held at The Building of The Scientific Associations at Helsingfors, 1 September 1925

§ 1. Dr. G. A. Wetterstrand, the President of the Association, declared the meeting open.

§ 2. Dr. G. A. Wetterstrand, the President, and Dr. Axel Reyn were appointed to record the minutes of the day.

§ 3. The President made a short speech in remembrance of the members who had died since the previous meeting, Sigfrid Ström and Ivar Bagge, and the honorary member, Dr. Jean Bergonié.

§ 4. The minutes from the previous meeting were read and passed.

§ 5. Prof. G. Forssell, Dr. A. Reyn, Dr. H. J. Panner and Dr. S. A. Heyerdahl were elected honorary chairmen for the meeting.

§ 6. On the proposal of the Council it was resolved to appoint Dr. Gösta Jansson as General Secretary and Dr. Chr. I. Baastrup, Dr. A. W. Schiander, Dr. Å. Åkerlund and Dr. N. Emelaeus as assistant secretaries.

§ 7. The report of the Treasurer was read and passed.

§ 8. On the proposal of the Council the meeting resolved to defray the costs of office-work and organization for the meeting out of the annual subscriptions and fees for the meeting that had come in, to lay aside 200 kr. as a reserve fund for the office-work at the next meeting, and to apply the remainder equally to translation and to the expense of printing the transactions of the meeting and as a contribution towards printing the introductory addresses.

§ 9. On the proposal of the Council the Association resolved that members of the Nordisk Förening för Medicinsk Radiologi should be exempt from the Congress fee, but that each non-member should pay 100 Finnish marks.

§ 10. On the proposal of the Council the following rules of procedure were adopted: 30 minutes should be allowed for introductory addresses, and 20 minutes for other addresses, or if required 30 minutes. For contributions to the discussion 5 minutes were assigned.

§ 11. It was resolved that the transactions of the meeting should be published in *Acta Radiologica*.

§ 12. On the invitation of the Danish members of the Council the Association resolved to hold its next meeting in Copenhagen in 1927.

§ 13. The Association resolved to elect Dr. Reyn as President till the next meeting.

§ 14. As members of the Council till the next meeting were elected from:

Denmark: Doctors Panner, Baastrup and Flemming-Möller,
Finland: » Wetterstrand, Jansson, and Hornberg,
Norway: » Heyerdahl, Thue and Berle,
Sweden: » Forssell, Åkerlund and Edling.

§ 15. On the proposal of the Council the Association resolved to lay down only one general subject for discussion for the next meeting, namely some question

regarding the use of roentgen diagnostics in pathological states in the lungs, and to entrust the introductory address on this subject to Dr. Hugo Laurell of Uppsala.

§ 16. On the proposal of the Council the Association resolved to invite the radiological associations of the countries participating in the Association each to appoint a lecturer to give a scientific address at the next meeting, the content of which should be decided in conjunction with the President of the Association. Three quarters of an hour should be allowed for each of these scientific addresses.

§ 17. The Association resolved to pass to the scientific transactions.

Ad protocollum

C. Gösta Jansson
Gen. Secretary

Scientific Transactions

I. Meeting at the Building of the Scientific Associations

on September 1st 1925 from 9.30—12 a. m. and from 1—5 p. m.

Roentgen and Light Treatment in Surgical Tuberculosis

Subject of discussion decided upon at the previous meeting

I. P. Amundsen, Oslo: Roentgen Treatment of Glandular Tuberculosis[1]

The author has after-examined 150 cases of persons who had undergone roentgen treatment (ambulant) for glandular tuberculosis during the years 1915—1922 (both inclusive).

The cases are divided into 3 groups. In *Group I* (simple hypertrophy of the glands), 26 patients, out of 32, were cured, = 81 per cent. In *Group II* (glandular hypertrophy with periadenitis), 32 patients were cured, out of 65, = 49 per cent, in *Group III* (suppurative glands and fistulæ), 41 out of a total 53 were cured, = 77.4 per cent.

For the 3 groups together, the percentage of cures is 66 per cent. Relapse was observed in 4 per cent, cutaneous changes in 10 per cent of the cases. All the cases were after-examined from 2 to 9 years after the end of the treatment.

The author cautions against continuing the roentgen treatment for years, because with treatment thus prolonged it becomes impossible to avoid the occurrence of cutaneous changes. — The irradiation, in each series, should be distributed over several days; and there should be an interval of from 5 to 6 weeks between the different series.

II. Ole Chievitz, Copenhagen: General Light Treatment in Surgical Tuberculosis[2]

The indications for the treatment of surgical tuberculosis at the Finsen Institute in Copenhagen were passed in review. For children it is predominantly conservative, combined with a universal light bath. For adults the same largely holds good, but there is a tendency to advocate rapid resection in tuberculosis of the knee.

[1] Published in *Acta Rad.* Vol. IV fasc. 4 page 340.

[2] Will be published in *Acta Rad.* Vol. V fasc. 2 1926.

III. L. Edling, Lund: The Roentgen Treatment of Surgical Tuberculosis[1]

The author dwells first on the different theories concerning the nature of the influence of the X-rays on tuberculous affections: the bactericidal, directly and indirectly by influence on the surrounding tissues, further on their influence on the tuberculous tissue itself by cell destruction on one side and perhaps irritation of connective tissue to organization on the other. Regarding the irritative effect of the X-rays supposed by STEPHAN and KOHLER the author is very doubtful, and the autotuberculinization theory of ISELIN is not supported by him.

As to the X-ray treatment of special localizations of tuberculosis the author has personal experience principally about tuberculous glands and tuberculous peritonitis.

Regarding tuberculous glands, firstly some historical points are given, and the author shows how X-ray treatment has, since about 1910, gradually taken the place of surgery. In diagnosing tuberculous glands, one should have in mind as well lymphosarcoma, lymphogranuloma and lues as especially chronic glandular affections of a septic origin, very like tuberculosis. The author divides the tuberculous lymphadenitis into 3 different forms, viz. (1) simple hyperplastic glands, (2) glands with diffuse periadenitis, and (3) suppurating, fistulous or ulcerated glands, and describes the effect of X-rays in these different groups. His own material comprises a total of 270 cases with 73 % cured, 14.8 % improved, 8.5 % recurrences and 3.7 % deaths.

Having discussed the X-ray treatment in comparison with the results of surgery, the author now proceeds to the development of technique with different authors and warns expressly against the large doses recommended especially by some German authors in connection with the breaking through of the modern deep therapy. The author maintains that the X-ray injuries occasioned by such dosage must and can always be avoided by a prudent and cautious technique. In connection with this, the proposal of REYN to replace the X-rays by light treatment, is met with some criticism from the author, who, on the other hand, recommends a combination of these two agents for certain cases. Lastly, the author's indications for X-ray treatment of glands are given.

Regarding tuberculous peritonitis, the author gives some historical facts as to the results of surgery compared with those of X-ray therapy and quotes different reports of this treatment. His own material comprises only 13 cases, partly surgically treated as well as radiologically, with mostly good results. By way of a general judgment, it may be said that X-ray treatment has greatly improved the prognosis with exudative cases and is able to give very good results also with adhesive and purulent-ulcerous forms where surgery is unfavorable.

The rest of the work includes urogenital tuberculosis, laryngeal tuberculosis and tuberculosis of the bones and joints. The author's personal experience with X-ray treatment of such affections being none or very poor, he has, in these provinces, limited himself to give an account of the principal literature and the results of different radiologists.

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[1] Published in *Acta Rad.* Vol. IV fasc. 5 page 397.

IV a. S. A. Heyerdahl, Oslo: On the Treatment of Surgical Tuberculosis with Carbon Arc Light Baths[1]

The first attempts to treat surgical tuberculosis with the arc-light policlinically, without other local or general treatment at the same time, were made by the present author at the Riks Hospital, Oslo, *in February 1913.*

The present work is a collective survey of the author's experiences in this domain, based upon clinical material observed for upwards of twelve years.

This clinical material comprises 69 patients who were suffering from various forms of surgical tuberculosis. Osseous and joint tuberculosis (21 cured, 2 improved), tuberculosis peritonitis (10 cured, 1 died), adnex tuberculosis (4, all cured), glandular tuberculosis (17 cured, 2 improved, 2 died). Scrophulo-tuberculosis and scrophuloderma (8 cured, 2 improved). That is, a total of 60 cured, 6 improved, 3 died (*pulmonary tuberculosis*).

The best results were achieved with children and often with comparatively short exposures. It is of extremely great importance that the light bath cure should not be interrupted, but should be carried on continuously for a considerable time, until a good result has been obtained.

Artificial light treatment must not prevent the necessary surgical operations or orthopædic treatment, but must be regarded as the best aid we possess at present for the treatment of these diseases, that is to say, next to sunlight.

IV b. S. A. Heyerdahl, Oslo: On Phototherapy in Surgical Tuberculosis

As my opening paper was printed in the *Acta Radiologica* (vol. IV, fasc. 4) in so good season, I may perhaps take it for granted that the members of the Congress are acquainted with, at least, its essential points. I shall therefore not tire you by reading it in full, but will dwell, just with a few words, on the last part of the summary:

»The best results were achieved with children and often with comparatively short exposures. It is of extremely great importance that the light-bath cure should not be interrupted, but should be carried on continuously for a considerable time, until a good result has been obtained.

Artificial light-bath treatment must not prevent the necessary surgical operations or orthopædic treatment, but must be regarded as the best aid we possess at present for the treatment of these diseases, that is to say, next to sunlight.«

The »when and how» of the surgical intervention must be a question for the surgeon to decide. What Dr. CHIEVITZ said in his lecture impressed me as being just the right thing. It was very interesting to see that he has formed a definite opinion as to which forms of surgical tuberculosis particularly demand surgical treatment in addition to the light-bath treatment, and which ones do not. By following the lines marked out by Dr. CHIEVITZ I believe we shall be assigning to the arc-light bath treatment the field which is rightly its own.

The experience of these twelve years has taught us that the carbon arc light treatment — provided it is correctly applied — never does any harm, but that

[1] Published in *Acta Rad.* Vol. IV fasc. 4 page 313.

in the overwhelming majority of cases it is helpful, especially through its bracing influence on the general condition of the patient and by the way in which it strengthens the system to resist the insidious disease of which we must never forget that — however localised it may often appear in its manifestations — it is a *systemic* disease and should be treated as such.

I shall not, here, dwell on the historical side of phototherapy. As regards the treatment with artificial light I have spoken of it in the first part of my opening paper. As regards the solar treatment I would refer to a paper — »Rollier and the solar treatment in tuberculosis», which I read in February, 1914, and which has since been published in the »Nordisk Tidsskrift for Fysikalsk Terapi», 1914.

In his most recent paper on light bath treatment: »On the efficacy of various sources of light for general light bath treatment» — which has been laid before this Congress — Dr. REYN has dealt so thoroughly with the various *artificial* sources of light, and with their effect in surgical tuberculosis, that I may refrain from dwelling any further on that side of the question.

I agree absolutely with Dr. REYN when he holds that for the treatment of surgical tuberculosis the carbon arc light is in every way superior, owing to its resemblance to the sunlight, its richness in ultra-violet rays and the fact that it contains all kinds of rays. In those respects it stands out, distinctly, from the other sources of light — from the mercury quartz lamp, for instance, which, to the detriment of light-bath treatment, has unfortunately been far too widely introduced and accepted, at least in Norway.

Also at the Rikshospital in Oslo we have repeatedly had occasion to compare the effect of the carbon arc light, in tuberculosis, with that of the mercury light; and in every instance the comparison has fallen out to the advantage of the former. The same has been the case in other Norwegian institutions where they have both these types of lamps — for instance, at the hospital in Ullevaal, Oslo.

There is one side of this whole question of phototherapy, on which none of the gentlemen to whom we have had the pleasure of listening here has touched, and on which I have thought that I would like to say a few words to-day as a sort of supplement to my printed manuscript; namely, the value of the alpine climate — and the alpine sun — as curative agents in surgical tuberculosis. In so doing I shall also be meeting a wish expressed by Dr. REYN in his last paper, in which he says, concerning solar treatment in »the Alps of Norway», that this is a subject of which, as far as he is aware, no special study has as yet been made.

Mountain sun and mountain climate — or sub-alpine climate — are two factors in the treatment of surgical tuberculosis of which we now know, from ROLLIER and BERNHARDT among others, that they are of the very greatest value.

How, then, are the conditions offered by Norway in that respect?

Already in 1914 — in the course of a lecture before the members of the Medical Society of Oslo — I pointed out very strongly what exceptionally favorable conditions for the institution of effective, methodical solar treatment, Norway possesses in her alps and in her subalpine valleys. On account of her geographical situation, Norway has a peculiar climate of her own, unlike that of any other country in Europe. On this subject, the Norwegian meteorologist HESSELBERG says: »From her geographical situation, Norway — and more particularly the northern part of that country — ought to have a perfectly polar climate with eternal snow and ice, a home for Eskimos and polar bears. But a number of circumstances combine to make the result an entirely different one. The country forms a projection on the western side of the great European-Asiatic continent. It therefore gets in a full measure all the advantages resulting from that situation: mild south-westerly winds blowing for years at a time, and warm ocean-currents flowing

incessantly, summer and winter, again its far-flung coast. The cold of its winter is tempered to such an extent that, the rays of the summer sun, only a minor portion is needed for melting the snows. The length of the days during summer raises the mean temperature still more and gives rapid growth to all vegetation. The result is that, for her situation, Norway has the best climate in all the world.»

Along the coast of Norway south-westerly winds are continuously blowing, and warm water from the Gulf-stream is being driven against her shores all the time.

A chart of the mean temperatures in Europe during the month of January shows at a glance this exceptional position of Norway in the matter of climate. The isotherms are drawn, here, for every 5 degrees Celsius. Isotherms for 0° temperature of the air run far up north away beyond 70 degrees latitude; going almost straight north-south in Norway, instead of running east-west. A little way out from the Norwegian coast, at 70 degrees latitude, we find the same temperature, in January, as in the south of Europe, on 45 degrees.

The curves of the other isotherms run almost in the same manner. In January, the temperature along the coast of Norway is about twenty degrees (C.) warmer than we might expect from its northern situation. It is true that toward the east, in over the country, the temperature becomes somewhat lower; but even in the inland tracts of Norway, where the winter cold can, in a certain few places, be rather severe, it is still 7 degrees higher than the mean temperature, for the same latitude, in any other part of the world.

It is evident that, with a coast and mountain climate like that of Norway, there must nevertheless be great differences, climaterically, between the various sections of the country. It is not every part of it that would be a recommendable place of residence for sick people all the year round. Thus it may be said that the greater part of the west coast, in spite of the exceptional conditions obtaining there in the matter of temperature, is very little suitable, either summer or winter, for persons in delicate health. It is true that the winter climate is mild, but it is also damp and windy; and the summers are damp, too, and rainy and rather cold.

If I should mention the parts of Norway which, both during summer and winter, offer the most favorable climate, especially as regards the climate of the higher altitudes, it would probably be the inland tracts south of the Dovrefjeld and east of the Jotunfjelds and the Langfjelds, and more particularly the alpine districts on both sides of the Valdres and the Gudbrands Valley. It is also in the last-named of those localities that the largest and most important of the Norwegian high-mountain sanatoria are situated. In these districts the high mountain ranges toward the west and north-west break the force of ocean storms and have already caused the sea air to give off the greatest part of its moisture. On the table-land of the Gudbrands Valley therefore, the air is on the whole, still, mild, pure and very dry. The sky is generally clear, and there is plenty of sun. One may live, according to choice, at any altitude, from 1800 to 3000 feet above sea-level. During the cold season these tracts are entirely covered with snow, which increases the effect of the sunlight immensely.

How, now, are the conditions in the alps of Switzerland?

The topographical configuration of the Swiss Alps presents — on a rather restricted area — a series of steep peaks covered with eternal ice and snow, with deep, cultivated valleys down between — or, at least, close up under them. This makes the climate of that whole alpine range unsteady, with frequent changes between heat and cold, with violent storms and sudden tempests.

In the high mountain districts of the Gudbrands Valley those drawbacks are not nearly as marked. In Norway it is not necessary to build the highland

sanatoria right up close to the regions of eternal ice and snow. It is a country of wide and ample stretches, and the sanatoria are situated, on an average, from twenty-five to fifty miles from the snow-line. Nor is it necessary, in Norway, in order to reach an alpine climate, to mount so high that the less desirable effects of the latter begin to make themselves felt also. While the Swiss highland sanatoria are situated at altitudes of from 3600 to 4500 feet, the Norwegian ones lie from 2400 to 3000 feet above sea level. But the sub-alpine climate also can, in Norway, be made use of with great advantage, at altitudes of from 1500 to 2400 feet, as is done, for instance, at Mesnalien.

The highland climate in the parts of Norway which I have just mentioned is thus the best possible high mountain climate in all Europe — for the majority of patients in general, but especially for those in need of solar treatment. The dryness of the air makes both the light itself and the effect of the light considerably stronger, at the same time as, for the same reason, there is plenty of it, and it is evenly distributed during the greater part of the year. The highland tracts of the Gudbrands Valley have the lowest yearly rainfall of any locality in Norway; namely, about 300 millimeters. Some tracts are particularly dry, like Fron, for instance, in the Gudbrands Valley, where the greatest worry of the farmers, especially during the spring and early summer, is usually the lack of rain. In Vaagebygden the farmers have, for the same reason, for times beyond memory, been obliged to use artificial irrigation.

But how, now, about the temperature of the air? Does the temperature of the air in »the alps of Norway» permit the use of sun-baths during the greater part of the year?

In the high mountain tracts of the Gudbrands Valley — as in all other high mountain tracts in Norway — the air, in summer, is relatively cold. This coolness, during the summer — as we know from LEYSIN — is a great advantage as regards the sun-baths, and permits a far more protracted daily solar treatment — namely, from four to eight hours — than is possible in the lowland. Nor is the cold felt to nearly as great an extent in the higlands as down below, owing to the dryness of the air. The cold of the high mountain tracts — provided it is not too intense — is, consequently, one of the chief advantages of those regions.

The winters in the high mountains — and especially on the high table-land of the districts I have mentioned — are, on the whole, considerably milder than it is generally imagined. This is due, in the first place, to the warm air currents which the Gulf Stream constantly carries along the coasts of Norway. The true mean temperature for the high table-lands of the Gudbrands Valley, during the coldest winter months, lies between — 7.5 and — 8.5 Celsius. Of the winters, too, it must also be remembered that up in the mountains the organism does not feel a low degree of temperature in the same way as down at sea-level. In the thinner, dry and still air of the high altitudes, a temperature of between —8° and — 10° is hardly felt as cold as a temperature of — 2° or — 3° in the heavy, moist and windy atmosphere of the lowland. This is due to the heat of the direct solar radiation — or »sun temperature» — which is ever so much stronger in the high altitudes. At Davos, the conditions in that respect may be seen from the following figures:

	Sun-temperature	Temperature in the shade
Dec. 22nd	+ 43°	— 10°
» 23rd	+ 40°	— 9.4°

The same conditions are found at the Mesnalien Sanatorium for Pulmonary Tuberculosis, which is the only sub-alpine sanatorium in Norway practising the sun cure for tuberculosis. We have no high-mountain sanatorium for surgical

tuberculosis. It has been found that, at Mesnalien, solar treatment can be given with excellent advantage during all the months of the year, except in December, January and February. During those three months, as well as on sunless days at other times, carbon arc light-baths are given instead, and have proved an excellent substitute. It has even been the case sometimes, at Mesnalien, that the solar treatment of certain patients has commenced as early as on February 2nd; but that, of course, has only been with patients already in every way inured to the climatic conditions of the place.

The experiment of sanatoria for solar treatment in the sub-alpine climate of Norway has, thus, been tried and has proved successful.

As long ago as in 1914 I recommended the establishment of sanatoria for surgical tuberculosis in the Gudbrands Valley and pointed out the excellent conditions offered by those regions for solar treatment; but my words found no echo at the time. Others will probably take up the question after me. It is to be hoped that they will meet with better success.

V. V. Malmström, Falun: Some Experiences in Connection with Light-Treatment in Cases of Surgical Tuberculosis[1]

This account is not intended to demonstrate the effectiveness of light-treatment in cases of surgical tuberculosis. This must be deemed to have been sufficiently proved before. The author has not had such a purpose in view when conducting his experiments. On the contrary, contemporaneously with the light-treatment, he has employed the sanatorium-cure, surgical and orthopædic measures and, occasionally X-ray treatment. The histories of a few sick-cases have been given as examples of what has been accomplished and what has not been able to be accomplished by this combined treatment. These are concerned with patients whose later fortunes it has been possible to trace for some considerable time after the close of the treatment.

During the early part of the treatment signs of reaction are often noticeable in the tuberculous foci. This prompts a certain caution. Lung-tuberculosis and fever are not, as a rule, to be taken as contra-indications — contrary to a rather wide-spread notion. Every case of tuberculosis, consequently of surgical tuberculosis also, should enjoy general treatment in which, if possible, light-treatment should form an integral part. It should be left to a skilled surgeon to decide whether surgical and orthopædic treatment should be used in addition. X-ray treatment may also be advantageously combined with light-treatment. A scientific investigation of the manner of action of the light-bath is greatly to be desired.

VI. A. Reyn, Copenhagen: The Efficacy of Various Sources of Light in General Light-Bath Treatment[2]

The author begins by briefly sketching the history of general light-treatment and mentions some of the investigations made, especially by FINSEN and

[1] Will be published in *Acta Rad.* Vol. V fasc. 2 1926.

[2] Published in *Acta Rad.* Vol. IV fasc. 6 page 541.

his pupils, concerning the capacity for penetration into the living tissue, of light from a number of different sources. Various conditions and problems connected with the cure of surgical tuberculosis by means of light-treatment are dwelt on, and it is pointed out that the attempts to account for the curative effect of the light in these affections have not, up to the present, led to any result; one question especially, in this connection, remaining unsolved; the question, namely, as to what particular rays in the light are chiefly instrumental in bringing about the cure. The clinical results, on the other hand, furnish some hints and show that the chemical rays — and among these notably the more long-waved ultra-violet, the violet and the blue ones — must be particularly important, but that also the luminous red rays play a certain role. On the basis of these considerations the author states as his opinion that the sunlight, wherever it can be utilised, is by far the best, and that sanatoria for surgical tuberculosis should always by preference be located either in alpine country or by the sea, in both of which situations all those rays are present in the sunlight in a high degree of intensity. The sunlight is only of use when it contains abundant quantities of chemical light. In northern Europe it is therefore during a considerable part of the year impossible to profit by the sun, because the greater portion of its chemical rays are absorbed by the atmosphere. During these periods, recourse must be had to artificial light. Various sources of artificial light are mentioned, and it is strongly argued that, of all these, the carbon-arc light is the best. The lamps must be specially constructed for this purpose, however; because most of the lamps found in the market do not satisfy the special requirements of this particular utilisation. Only direct current power can be used, because it is the light from the crater that plays the important part in the treatment.

VII. G. A. Wetterstrand, Helsingfors: Roentgen Therapy in Surgical Tuberculosis[1]

The writer gives an account of the experiments he has made and the results he has obtained in the roentgen treatment of surgical tuberculosis. He for his part considers that as a method of treatment it has, roughly speaking, the same value as the other methods now in use, provided that the common precautions are not neglected. In many cases, moreover, it possesses the advantage that it can be employed policlinically — which is a substantial advantage from the standpoint of social economics. — With regard to doses the writer considers that small ones are the best, about one-third H. E. D., with an upward allowance of 20 %, or at most 50 %.

A considerable part of the material consists of *tuberculous lymphomata*, with after-control in 234 cases. Difference in stage exercises but little influence on the result, but the period of treatment is prolonged by the spreading and fistulous forms. Filter 3 Al or possibly 0.25 Cu. Careful precontrol of the skin. No local irritations allowed throughout the whole period of treatment. *Relapses*, or possibly newly developed glands, in 4 %. Non-dangerous *skin changes* in 12 %; atrophy and telangiectasy in 3 %. No necrosis.

The treatment of tuberculous peritonitis has proved extremely effective in the cases where there have been no complications in the lungs or intestines. Out

[1] Published in *Acta Rad.* Vol. IV fasc. 6 page 528.

of 24 cases 15 were cured, with an observation-period of 2—5 years; transient improvements in 5 cases, 4 cases not cured.

Tuberculosis of the female genital organs reacts extremely well, and here the writer sees the best remedy at present in roentgen irradiation. Out of 10 cases 4 (hopeless when the treatment started) are well; 3 have been free of symptoms for two years; 2 are still under treatment (improved); and 1 has disappeared. Cases operated ought to be radiated afterwards.

In tuberculosis of the male genital organs too little attention is paid to roentgen therapy. Here the writer's 9 cases (8 of epididymitis and 1 of deferens-relapse) have all been restored to health.

Cases of fistulae after nephrectomy, tuberculously infected puncture canals, and generally secondarily affected nests of disease in soft tissues give a good prognosis. *In tuberculosis of the bones and joints* also the roentgen treatment is gaining a good position.

VIII. M. Simon, Stockholm: When Should Roentgen Treatment of Lymphomata be Combined with Surgical Interference?

Those gentlemen who have opened the discussion have pronounced so many of my own views about the treatment of tuberculous lymphomata that I am able to shorten my paper and rather make it a contribution to this discussion about surgical tuberculosis.

I should like to support the opinion expressed by Dr. AMUNDSEN and others that it is to the advantage of the patients, if roentgen treatment in many cases be combined with operation at quite an early stage.

We can now consider it a matter of the past when, in order to form an opinion about the roentgen treatment, we strove to compare the results thus obtained with those obtained from surgical measures. Naturally at that time, one was apt to treat the patients with only one of the two methods, which frequently resulted, as far as radiology was concerned, in a far too long course of treatment.

At the present day, however, the value of roentgen treatment is sufficiently established to permit, in the individual case, a more general use of one method combined with the other if the period of treatment can thereby be shortened and the result improved.

In deciding about the treatment I am guided by the following indications:

Group I. (Hyperplasia with or without fibrosis). All cases with considerable enlargement of glands should be treated with roentgen rays. If after four applications (each $^1/_5$ H. E. D. through 4 mm. Al) the treatment has little or no influence on the glands, then I have roentgen photographs taken of the glands, before proceeding with further treatment. Many of those photographs show calcifications. If the glands have shown themselves to contain lime, and if in addition to this an active process is clinically suspected, then I consider operation advisable.

If lime is present in a clearly fibrotic gland that shows no signs of activity, operation is not necessary, nor should the roentgen treatment be unnecessarily prolonged.

Groups II and III. (Lymphomata in dissolution with or without fistulas). These cases can all be irradiated without delay. It is not advisable to postpone the treatment until a time after the operation. Fistulas seem to heal quicker after

the operation when they have been previously treated with small doses of roentgen rays.

In my opinion the risk of producing scrophuloderma is not so great as has been suggested by Dr. AMUNDSEN, provided the doses are very small, even smaller than those I generally employ, viz. 1/5 H. I have not seen the skin injured in a single such case during the last 13 years.

Concerning the mode of surgical procedure, I should like to mention that a small incision (with a knife) appears to be a better method than puncture, in cases where roentgen treatment has been given. I will not deny that puncture is to be preferred in cases that cannot get roentgen treatment, but *with* such treatment the result after incision will be found at least as good, either with or without scraping. Furthermore, through incision one has the advantage of hastening the result by being able to remove the cheesy mass.

(Demonstrations of films showing calcifications of cervical glands.)

Discussion:

1. DAVID OTTOSEN, Copenhagen: At the instance of Dr. PANNER I have collated, for this Congress, the statistics from the Phototherapeutic Clinic of the Rigshospital, at Copenhagen. The clinic was opened in July, 1920. Since then, it has treated about 750 patients; the majority of them, by far, for surgical tuberculosis. The patients are sent to us partly from the wards, partly from the Policlinic. Owing to the character of the Hospital we receive a great many chronic cases that have already been under treatment elsewhere, and which are almost hopeless, often with amyloid degeneration. This is especially true of those that come under the headings: spondylitis and coxitis. In a great many cases the period of treatment, at the Clinic, has been altogether too short, partly because the various Departments of the Hospital are not in a position to keep the patients as bed-cases for months, as would often be necessary, and partly because a number of the patients only begin their treatment at the Clinic, afterwards going somewhere else, for instance to the coast-sanatoria, where they are admitted as soon as a vacancy occurs. Only 231 patients have been treated at the Clinic for a full 3 months or more, and only those are included in the charts exhibited here. Also a number of cases in which the diagnosis was not absolutely sure have been eliminated. As in most other clinics, the treatment has been at once surgical and orthopædic, and, as regards the hospitalised cases, with observance, at least in part, of a sanatorium regimen. Most of the cases from the Policlinic, on the other hand, are individuals living under very poor conditions, materially; and this undoubtedly contributes very largely toward reducing the percentage of cures. Reliable information as to the after-results of the treatment has been difficult to obtain, especially as regards the patients come from the Policlinic. After-examination has only been possible in about 50 per cent of the cases. The recurrences were few; not above 5 per cent. A number of the cases have improved or even been completely cured after the treatment had ceased. This makes us believe that the cure-percentage would have turned out higher if our efforts to get the cases after-examined had been more largely successful. The treatment was done with carbon arc-light; in the case of some of the children with quartz-light. The statistics are of interest as showing what can be obtained by means of light-treatment, and what cannot, under the conditions in which that therapy is employed at the Rigshospital, at Copenhagen. (Demonstration of statistical charts.) Figs. 1, 2 and 3.

	Ant.	Bt. < 4 md.	Fst.	Op.	Rb.	H.	B.	U.	F.	D.
Spondylitis	15	2	5 (13 Abc)	9	0	1	5	6	1	2
Coxitis	10	1	9	9 4 Res.	0	1	4	4	—	1
Tbc Genus	14	6	6	6 4 Res.	3	7	3	4	—	—
Synovial	11	—	—	—	3	5	3	3	—	—
Osseous	3	—	—	—	—	2	—	1	—	—
Tbc Tal-cruralis	6	1	4	3 1 Res.	2	5	1	—	—	—
Tbc Pedis	3	0	1	0	1	2	1	—	—	—
Tend.-vag. synovitalis	3	1	1	1	1	1	2	—	—	—
Tbc Humeri	8	1	2	2	0	6	1	1	—	—
Synovial	2	—	—	—	—	2	—	—	—	—
Osseous	6	—	—	—	—	4	1(0)	1(0)	—	—
Tbc Manus	8	2	2	1	2	1	5	2	—	—
Tend.-vag. synov.	12	5	6	6	7	6	4	2	—	—

Fig. 1.

	Adenit.		Tub.			Result.			
	Ant.	Bt. < 4 md.	Fst.	Rb.	Op.	R. + O.	H.	B.	U.	D.
Colli	74	43	42	10	16	16	34	39	1	—
Light only	32	—	11	—	—	—	15	16	1	—
Bronch.	14	4	—	—	—	—	4	8	2	—
Mesent.	8	4	—	1	4	—	3	2	—	2
Periton.	15	6	6	4	8	—	5	7	2	1

Fig. 2.

	Ant.	Bt. < 4 md.	Fst.	Op.	Rb.	H.	B.	U.
Ostit. Tbc	21	3	21	12	2	16	3	2
» Uln.	2	1	1	1	0	2	—	—
» Spin. Vent.	4	0	4	0	0	4	—	—
» Os Metarc.	1	0	1	1	1	—	—	1
» Pelvis.	4	1	4	3	0	1	2	1
» Femur.	4	0	4	3	0	4	—	—
» Crur.	1	1	1	0	0	1	—	—
» Zygom.	1	0	1	1	0	1	—	—
» Cost.	2	0	2	2	0	2	—	—
» Multiloc.	2	0	2	1	1	1	1	—
Tbc Renis. Seq. Nephrec.	13	5	10	13	3	9	3	1
Tbc Epidid.	7	1	7	7	1	6	1	—

Fig. 3.

Ant. = Numbers of patients; Bt. = Time of treatment; Fst. = Fistula. Op. = Operation; Rb. = Roentgen treatment; H. = Cured; B. = Improved; U. = Unchanged; F. = Worse; D. = Dead; Abc. = Abscess; Res. = Resection; 4 Md. = 4 Months.

2. A. REYN, Copenhagen: To the interesting papers that have been read here to-day I should like to make a few brief remarks. To Dr. EDLING I wish to say that he seems to misunderstand, on several points, my attitude toward the roentgen treatment of lymphomata. Unfortunately I did not receive a copy of his paper until after my departure from Copenhagen, and thus I have been unable to arm myself with as complete a material as I could wish in order to show him in what particulars I believe him to be mistaken. But when he says that I am the only one who is not entirely satisfied with the treatment I should like to point out that BROCA and MAHAR have 46 per cent of cures; HACHER, too, 46; and STARKER 42 per cent. It is true that I am the one who has the lowest percentage of cures; namely 39.3 per cent; but I particularly call attention to the fact that my percentage would have been somewhat higher if I had pursued the treatment somewhat more energetically as regards the fistulous forms. That I did not do so was simply because I obtained so very much better and speedier results, in those cases, from a combination of *light-treatment with Roentgen;* and I believe it to be of the very highest importance, precisely in cases of that type, to get the fistula healed up as quickly as is in any way possible; not only on account of the extreme discomfort which it always is to a patient to go around with a fistula on his neck, but also because I regard the fistulous, glandular tuberculosis as contagious for the surroundings of the person affected with it.

Dr. EDLING also says that I cannot be right in advancing, as one reason why my results with the roentgen treatment were inferior to those obtained by other workers, the fact that my cases were chiefly old ones, »because, on the average, his cases were older; namely, from 21 to 45 months old; while, of my cases, the average had only been 6 months for the adults and 2 years for the children». But here Dr. EDLING has simply misread me, getting »months» instead of »years» for my adults. As a matter of fact the average for the latter was 70 months, or approximately 6 *years*. And when this is coupled with the fact that, especially in the beginning, I mostly got patients who had been trying every other sort of treatment before coming to me, then it seems to me that I am really justified in suggesting this as one of the reasons for the inferiority of the results registered by me.

When Dr. EDLING further says that the explanation of my inferior results is rather to be sought in the incomplete treatment and in the fact that a great many of my cases were of lymphomata more or less fibrous and, for that reason, fit for surgical treatment only, I should like to remark that, as regards the incomplete treatment, that incompleteness applies only to the fistulous cases — as I have myself pointed out, but certainly not to the hyperplastic forms, for which the average treatment was of about nine months; consequently, as a matter of fact, a very energetic carrying through of the roentgen treatment. Nor does the other explanation — about the fibrosity of the glandula and their consequent unfitness for any but surgical treatment — hold good. Of 150 cases in which the roentgen treatment failed to bring about a cure, 106 were subsequently put under light-treatment, and of those 105 were cured. But if these had been fibrous glandulae they would, of course, not have reacted to the light-treatment, either. No, the reason simply is that the light-treatment offers a greater chance of success than the roentgen treatment. I still maintain, as I said in my article, that the roentgen treatment is *not* an ideal treatment. And in that opinion I have been still further confirmed during the last few years, by seeing how many patients are constantly being sent to me after having been treated with Roentgen elsewhere without result. And, as a matter of fact, Dr. EDLING himself only confirms this assertion of mine when he says that in refractory cases he has seen excellent

results from a combined treatment of light and roentgen. For if such a combined treatment is superior in the cases that resist roentgen radiation alone, it is evident that it must be superior in *all* cases, as shown also by my 92 per cent of cures.

One thing which I have pointed out a good many times before, but on which I wish to lay stress again, in this connection, is the fact that a person suffering from tuberculous lymphadenitis is a tuberculous individual and should, as far as possible, be treated not only locally, but generally as well. And it is here that the light-treatment offers far more than the roentgen treatment.

On the whole, Dr. EDLING and I are not as far apart in our views as it might appear. I have maintained that a combination of light and roentgen treatment is the best. And I have said that, inasmuch as the light-treatment is in several ways a more circumstantial one, we may commence with roentgen treatment alone; but if the effect of the latter does not become manifest in rather a short time we should begin to apply the light-treatment. I also wish to say that if the patient resides anywhere near an institution where both forms of treatment can be obtained he will gain in every way by undergoing the combined treatment. He will get well quicker and more surely; and, except for the hours actually taken up by the treatment, he will be perfectly able to attend to his usual duties or occupations. One thing which, to my mind, proves that the roentgen treatment is not the ideal one, is the fact that its technique is continually being modified, and is different in different places. That is not the case with an »ideal» treatment. The point on which I wish to insist is that we must not with undue partiality cling to one form of treatment or the other, but that it behooves us to accept and bring into service *all* the means and measures at our disposal. In that way only can we be sure of the best results.

I do not agree with Dr. EDLING when he says that solitary, mobile glandulae ought not to be extirpated. If we wait and subject them to roentgen treatment for a time, we risk that the glandula falls away, and then it will be much more difficult to remove. On the whole subject of glandular tuberculosis my views are to-day precisely the same which I formulated in an article in volume III of the *Acta Radiologica* a while ago. To that article I beg leave to refer you for further details.

To Dr. MALMSTRÖM I should like to make the single remark that I do not believe that, in tuberculosis, the same results can be obtained from the mercury quartz-light as from the carbon arc-light; and the case-reports which he has published only confirm me in that opinion.

What Dr. OTTOSEN has told us seems to me very interesting as regards the results obtained at the Rigshospital, at Copenhagen. If we take into consideration that that institution is, at the same time, a medical training-school, and is destined for acute diseases, and if we further consider that the Clinic not only receives chiefly patients whom surgical intervention has failed to cure, but over the duration of whose stay it has no control — then it surely must be said that the results obtained there are a powerful testimony to the power of Light as a weapon against tuberculosis.

3. G. FORSSELL, Stockholm: When we adopted as a subject for discussion the roentgen and light-treatment in surgical tuberculosis, and when we invited our most eminent men of science in these departments to introduce the discussion, this was done in the hope of getting clear light thrown on this subject from all sides. Nor have our hopes been disappointed. The introductory addresses to which we have had the pleasure of listening have made very clear both the extent and the limitation of these forms of treatment, so far as our experience now extends. It

would seem that we can now regard it as established that both roentgen and light therapy, if the technique is only good, give excellent results in many forms of surgical tuberculosis. Neither of these methods of treatment can claim to be the only right one. According to the experience of all the speakers, a combination of both forms of treatment seems to be the best treatment in the majority of cases.

The light treatment, especially through the extraordinarily successful work at the Finsen Institute in Copenhagen under the guidance of REYN, has reached such a high degree of development that that method is now indispensable in the treatment of surgical tuberculosis. It is therefore necessary that this form of treatment should be installed in every radio-therapeutic department, and that radiologists should have opportunities of being trained in this method.

The results that have been obtained with roentgen treatment, especially in glandular and peritoneal tuberculosis, have become ever better and surer, thanks to the improvement in the technique in the course of years. The Scandinavian roentgenologists, as a rule, have obtained results fully comparable with those attained by the best foreign roentgenologists. Thus EDLING, for instance, has effected a cure in about three-quarters of his 270 cases of tuberculous glands, and injuries to the skin have been reduced to rarities if the technique has been suitable. Where injuries have been caused, it has been possible to show that there has been an overdose, or that the skin had been badly injured through the tuberculous condition. Our results at the Seraphim Hospital, as is well known, have been published by RUNSTRÖM in *Acta Radiologica*, Vol. III, and are in fair accordance with the experiences gained by EDLING. Hence it has aroused a great deal of attention, not only in Scandinavia, but also in many other places in the world, that AXEL REYN, the great master in the sphere of heliotherapy, has attained such unsatisfactory results with the roentgen treatment of lymphoma that a cure has not been obtained in more than a bare 40 % of the roentgenologically treated cases, while a nearly 99 % cure has been reached in the cases that have been treated only with light. And at the same time injuries have arisen in more than one-fifth of his roentgenologically treated cases, including a large number of bad injuries.

It would be of great interest to get the causes of this bad result investigated. To me it seems highly probable that the true cause of this lack of success is substantially to be sought in a comparatively unsuitable method of technique of treatment. It appears from REYN's publication that in the majority of cases larger doses have been employed than are commonly thought suitable, in addition to which the treatment has been given with relatively short intervals, even when the doses have been relatively large. The numerous and severe damages to the skin also show that overdosing must have taken place, for such injuries never arise without an overdose. Such excessive treatment involves a worsening of the results. Moreover, in a number of cases, the roentgen treatment has not been followed up. Hence REYN's results, as I have already pointed out before, cannot be used as comparative material when we are concerned with judging the value of roentgen treatment.

There are two cardinal problems which constantly occur in the matter of roentgen therapy; and they are the question of the doses, and the length of the interval between the treatments.

With regard to the doses in the treatment of surgical tuberculosis, everybody seems now to be agreed that the doses must be highly individualized with regard taken to the clinical nature of the disease and to the age and general condition of the patient, and also with regard taken to the course of the healing process and the length of the intervals between the treatments. No fixed and definite tuber-

culosis dose can be laid down; but the dosing must largely be made individual on the basis of personal experience. On the whole, the smaller doses are to be preferred.

As regards the determination of the intervals between the treatments, an interval of 3—4 weeks has usually been adopted in the first series of treatments, and afterwards increasing intervals. In determining the length of the intervals, the treatment seems to have been usually planned with the main idea of avoiding skin injuries. It is highly probable, however, that the suitable definition of the intervals plays an important part in the result of the treatment. With regard to this side of the treatment we must bear in mind that every irradiation begins an biological process and has a definite course. The irradiation produces a change in the pathological tissue, and this involves a reaction from the environment in the form of a series of phenomena in the tissue, such as the formation of anti-toxin and the phenomenon of proliferation in the vessels and the connective tissue — which together probably condition the course of healing.

Renewed irradiation affects not only the originally pathological tissue but also the newly-formed tissue which has arisen as a reaction against the irradiation first given. In addition to this, as is well-known, the treatment starts a general reaction, for instance in the form of a change in the blood, the course of which is also affected by renewed treatment.

The important thing, therefore, is so to adapt the intervals between the treatment and the magnitude of the doses that a renewed treatment does not disturb or hinder the healing process that has begun.

We encounter similar conditions in serum treatments, where also the reaction has a definite course, to which the treatment intervals must be adapted.

A similar state of things is met with in the radiotherapeutic treatment of new formations in which the result of the treatment is in an extremely high degree dependent on a correct application of the intervals between the treatment and of the size of the doses. There too it is at least as important not to disturb the healing process, and not to diminish the resistance of the body, as to weaken the tumour — as I have maintained on many preceding occasions. In order to gain a clear conception of this important problem, we must have new and systematic research. In this question we perhaps obtain a certain amount of guidance through the investigations published by BAISCH, which show that within three weeks a distinct proliferation of vessels has occurred in the surroundings of the irradiated glandular tissues.

With regard to *heliotherapy* I should like to put a few questions to those colleagues present who possess extensive experience in this department; and the answering of these questions seems to me to be a matter of great practical importance:

(a) Has it been shown what importance the visible skin reaction has for the therapeutic effect? — Does the skin reaction form a necessary condition for the attainment of a full effect from the treatment, and can the planning and prognosis of the treatment on the basis of existing experience be judged on the basis of the reaction?

HEYERDAHL seems to take up a very definite attitude to this problem. It looks as if he considers that the skin reaction involves increased vitality and enhanced functioning of the skin, which forms an essential element in the treatment, and that an incapacity on the part of the skin to react to the irradiation means a bad prognosis for the light treatment. From other publications I have not been able to obtain a definite opinion as to the views of the authors on this

question, which nevertheless is of great importance for the effective practice of heliotherapy.

(b) Is there any definite experience as to whether a simultaneous irradiation with roentgen light and sunlight, or a roentgen treatment in connection with light treatment, involves any serious risk to the patient, provided that the roentgen treatment is kept within the limits set by experience?

If so, what are the damages that have been observed?

In any case is it not safest, if light treatment and roentgen treatment are combined, to protect the roentgenologically irradiated parts against the rays of light?

(c) In the treatment of young children, has the quartz lamp any advantage over the carbon arc light, as is assumed in many quarters, because the quartz lamp develops less heat and permits of a shorter period of treatment?

4. L. Edling, Lund: As regards Dr. Simon's paper, I should only like to draw attention to the fact that it is by no means rare to find calcifications present in lymphomata already before commencement of treatment, so that, on dissolution taking place, one is able to obtain chalky deposits on scraping. The presence of shadows on the roentgen plates, caused by calcifications, should not, therefore, prevent roentgen treatment in cases of large lymphomata.

Dr. Reyn's defence of his statistics concerning lymphomata compels me once again to emphasize its fallibility in the light of the fact that the fistulous cases which have not been roentgen-treated with sufficient energy, but been sooner or later transferred to light therapy, are yet held up in comparison with the cases of other authors, treated lege artis with X-rays only.

When Reyn denies that any considerable number of the closed glands in the last group have been of fibrous nature, one must conclude that his bad results were altogether the outcome of a faulty technique in the treatment.

I repeat again that I willingly admit the great merits of light treatment in lymphomata but that, from reasons already stated, and contrary to roentgen treatment, it is not available to all patients. Regarding, again, the combined roentgen and light treatment that I prefer to give in suitable cases, I have, for want of carbon arc light, used a quartz lamp for general irradiation. To avoid damaging the parts of the skin already treated by the roentgen rays — a risk feared by many authors — I have allowed one week to elapse before exposing the patient to the quartz light. Such treatment has then been given for 2—4 weeks, every or every other day, according to circumstances. In doing so, I have left uncovered the parts previously exposed to the roentgen rays, and although I have carefully looked for any possible skin irritations, I have been unable to detect any, nor any changes in the skin of secondary nature.

Finally, as regards the length of the intervals, I have given an account in my paper of the praxis experience has taught me to be the best. In so doing I have not omitted taking due notice of the investigations of Baisch, quoted by Professor Forssell, but I must candidly confess to having omitted to consider the special and important rôle of the fresh connective tissue. I want to express my most sincere thanks to Professor Forssell for the light he, in such an elucidating manner, has thrown on this undoubtedly most important factor.

5. S. A. Heyerdahl, Oslo: Professor Forssell wishes an answer to the following questions: (1) What bearing does the cutireaction have on the course

of the tuberculous process? (2) When should a combined roentgen and light-bath treatment be employed? (3) What is the most suitable light-bath dosage for tuberculosis in the case of children? (4) What lamps should be preferred: arc lamps or quartz lamps?

When it is a question of surgical tuberculosis it should always be borne in mind that tuberculosis is a systemic disease and should best be treated as such. It is therefore always best, besides the local roentgen treatment — in cases of glandular tuberculosis, for instance — to give general light-baths at the same time. With us, it is not always possible, unfortunately, to make this a general practice; partly because we lack the room, and partly for economic reasons; but I always try to make shift to procure both roentgen and light-bath treatment at least for the children with glandular tuberculosis, and especially for those that are, at the same time, of an anemic and weakly (scrofulous) constitution.

In the case of grown individuals suffering from local, glandular tuberculosis, but who do not otherwise show any manifest signs of being tuberculous, roentgen treatment alone — or combined with puncture or incision of the abscess — will usually bring about the desired result. Surgical tuberculosis in children, as I already remarked in my opening paper, is an extremely gratifying subject for light-bath treatment, and it is almost incredible how small daily doses are often needed in order to bring about a cure. But for details of this I would refer to my published cases from the early years — 1913, 1914, 1915 — when the arc-light treatment was something quite new and it was necessary to feel one's way very carefully, experimenting warily all the time, because we did not, as yet, know anything about the general effects of the arc-light in tuberculosis.

As regards the bearing of the cutireaction on the tuberculous process I can only say that, according to my personal experience, the patients whose skin reacts well to the light-treatment also make a good prognosis. Under the influence of the light the slack, anemic skin becomes firm, elastic and plethoric. If, on the other hand, the skin remains grey and anemic in spite of the light-bath treatment, there is usually only slight improvement to be observed in the general condition, or none at all. But, fortunately, this is very rarely the case.

There is no doubt but that the arc-light is altogether superior to the quartz-light, even if we admit that good results are seen also from quartz-light treatment, in surgical tuberculosis, and especially in the lighter forms of tuberculosis in children.

6. A. Reyn, Copenhagen: To Dr. Edling I wish to say that my poor results cannot be due to the technique I have employed; for I have used about the same dosage as the other authors. As regards the combination of roentgen and light-bath treatment I wish to call attention to the fact that, with patients living in the country, an easy and practical way of obtaining that combination is to give them the roentgen treatment at the clinic and then to let them take sun-baths at home during the summer. I use that expedient not infrequently.

To Prof. Forssell I would first repeat that it is not to the dosage that the relative inferiority of my results with roentgen treatment of the lymphomata is due; for if we look at the figures in my paper it will be seen that 90 of the cases treated have been given 5 H, or less, through from 3 to 5 mm. Al., which is precisely the dosage now recommended; and, still, the results from those small doses are not noticeably better. A number of the others were given larger doses,because intensive dosage was at that time being so strongly advocated; but, as I have said in my article in the *Acta Radiologica*, vol. III, I have come away from those large

doses again, because they do not work well, and because they too often produce roentgen changes in the skin.

As regards the other questions put by Prof. FORSSELL, they are so intricate that it would take several hours to answer them at all fully. The risk in combining roentgen and light-bath treatment is that in light-bathing the roentgeniged area one may produce erythema with the use of doses which would otherwise not have that effect; and I have seen in granulomatosis, for instance, after large roentgen doses, the occurrence of bullous dermatitis. But if the roentgen radiated area is kept covered during the light bath there is no risk whatsoever in combining the two treatments.

The therapeutical effect is undoubtedly dependent on the cutireaction; but the latter cannot be used as a measure for the extent of the former. The cutireaction as an expression of the therapeutical effect has come so strongly to the fore because it was insisted, from Switzerland, that the pigmentation played a great rôle as regards the cure. But that is an assertion which I have always maintained to be wrong; and I have had the satisfaction to see the theory gradually abandoned again, until it is by now reduced to BERNHARDT's saying that the pigmentation »seems to indicate» a better prognosis. To measure the prognosis by the cutireaction is, as I have just said, impossible. The nearest truth about the relation between the two is probably that with patients very severely affected we begin the irradiation carefully and by smaller doses, which *eo ipso* results in a slighter cutireaction; while with patients who do not present any particular, grave symptoms beyond the surgical tuberculosis we dose more strongly from the beginning, thus producing a more marked cutireaction. It is only through the observation and the development of the case that it can be learned whether the patient is deriving any benefit from the light-baths; and — just as with every other therapy — there will, of course, always be some that fail to improve under the treatment. At the same time, I believe the cutireaction to be a factor of great importance. The influence, on the organism, of the reactions taking place in the skin has become more and more widely realised of recent years; and there is no doubt but that the photo-reaction plays a rôle, in that connection, as either stimulating or inhibiting the others; but unfortunately this is a subject on which our knowledge is, as yet, extremely slight.

Prof. FORSSELL asked whether, with children, we got better results from the mercury light than from the carbon-arc light, and in that connection he pointed to what Dr. HEYERDAHL had said: that the heat from the carbon-arc light might have a hurtful influence on the children. To that I must say that, in my opinion, the carbon-arc light gives better results than the mercury light, also in the case of children; and that — although we have, by now, treated several hundred — we have never, even in the case of the quite small ones, noticed the slightest sign of inconvenience or ill effect from the heat. Only with patients suffering from some affection of the heart particular care has to be exercised; but even in such cases it is, of course, always easy to temper the effect of the heat by the simple expedient of placing the patient a little farther away from the light and then irradiate for a little longer while, as explained in the article on light-bath technique, in the *Acta Radiologica*, vol. IV. If, now, we ask about the effect of the mercury light on the children, it must be remembered that tuberculosis yields to treatment far more easily in children than in grown-ups, and for that reason alone the results from mercury-light baths are bound to be, on the whole, more satisfactory when the subject is a child than otherwise; but, all the same, the carbon-arc light is better. I wish to add, however, that if a coast-sanatorium for children finds great difficulty in obtaining the necessary current for a carbon-arc light plant, then a

mercury-quartz lamp is certainly better than no light-bath at all, for it will, at least, always aid in bringing about a result.

On the whole, I wish to say that it would be well, indeed, for the radiologists to know the time of their visitation and to set about the installation of light bath-plants, as otherwise that therapy will surely pass from their hands into those of other disciplines.

7. G. FORSSELL, Stockholm: It is necessary to have information on the influence of the technique on REYN's results. Dr. REYN said in his last statement that the roentgen treatment in cases of lymphona fails more often than we have reason to suppose from publications. This opinion Dr. REYN supports by the patient material which he reviewed at our last meeting, and which he has published in *Acta Radiologica*. For the most part, however, these patients were not treated with the technique which, in the opinion of the most experienced radiologists, has been found to be the most suitable. The doses are to a large extent greater and applied more closely together than has been found suitable; and the treatment has given rise to injuries which, according to our experience, do not occur except in consequence of erroneous technique with over-dosing. Hence the roentgen material of the Finsen Institute is not suitable for comparison in estimating the mutual value of the different methods. In proportion as the combined light and roentgen treatment come into greater use, indeed, it will become more difficult to estimate the part of the roentgen light in this effect. It is of great importance, therefore, to obtain a correct notion at this stage with regard to the value of roentgen light.

8. A. REYN, Copenhagen: When Prof. FORSSELL once more attributes my relatively unsatisfactory results to faulty technique I must deny that assertion most emphatically, and I must point out that, with the exception of a couple of cases — for which, as far as I remember, I have accounted in my article on »Lymphomata», I have had no erythemata at all. I have myself expressly stated that in a certain number of cases the doses afterwards proved to have been too large, as shown by the cutaneous changes that occurred later on. But those changes may declare themselves months, or even several years, after the treatment has been ended, without there ever having been any visible macroscopic roentgen reaction. Of all this a detailed account can be found in my article, in vol. III of the Acta, to which I must again refer you.

9. F. v. BERGEN, Gothenburg: In Gothenburg we have also made use of the larger doses just mentioned in the treatment of lymphomata. Only in quite exceptional cases have we observed an erythema resulting, but one has always been able to trace this to faulty technique, a larger dose having been given than was intended. The reactions in the skin of an erythematous nature which have been observed in the treatment of lymphomata, must, to my mind, in spite of the assumption of a non-erythematous dose having been given, in reality depend upon the application of an overdose and there is little doubt that the changes in the skin observed by Dr. REYN are due to this cause.

10. A. REYN, Copenhagen: In reply to Dr. v. BERGEN I must once more maintain, most emphatically, that I have not had any erythemata. I persist absolutely in my view of this whole question, and I have been still further confirmed in my way of looking at it by seeing the cutaneous changes presented by a number of patients who have been referred to me for treatment after unsuccessful

roentgen treatment elsewhere. If I had really had erythemata, it would, of course, never occur to me to hide the fact. I can only, once more, point to my article in the Acta, in which you will find every necessary information in regard to these questions.

11. G. FORSSELL, Stockholm: We have now heard from Dr. REYN that his lymphoma patients have not, in his opinion, had too large doses and have not shown any skin reaction after the treatment. Nevertheless a large percentage of them have shown bad skin changes, such as, according to general experience, do not appear except in consequence of over-doses. In that case we are surely justified in drawing the conclusion that Dr. REYN's material does not permit of any general conclusion, but that his results apply only to his own material and to the technique employed by him.

IX. H. J. Panner, Copenhagen: Colic Invagination

Dr. PANNER reports a case of colic invagination, due to a cancer of the transverse colon, in which the roentgen examination with an opaque enema showed up all the features of the intussusception, both as regards its precise situation and its extent. Examination with an opaque meal administered *per os* gave a negative result.

In chronic and sub-chronic cases, the condition of the patient will generally allow of an examination being made with administration of an opaque substance, but only in a few cases does it seem that a pathognomonic finding is obtained. In these cases it is, as a rule, *either* the opaque meal per os *or* the opaque enema which gives the diagnosis; and inasmuch as it is never possible to know beforehand *which* of these two methods will eventually give a positive result, it is necessary, in all cases, to use them both.

Acute cases will not allow of an opaque examination. But an ordinary screen examination — with the patient either standing (sitting) upright or lying on his side — will at least sometimes serve to verify the presence of an enterostenosis. The latter will show itself by loops of the intestine being dilated, filled with air, and containing liquid, the surface level of which will be horizontal. Only in very exceptional cases, however, will this screen examination probably be diagnostically decisive as regards the exact character and precise situation of the enterostenosis.

Discussion:

1. CHR. BAASTRUP, Copenhagen: As a supplement to the interesting communication made by Dr. PANNER I wish to say that I have seen a forked opaque-meal shadow, similar to the one in his pictures, arise from a different cause.

The case was that of a boy, aged 8 or 9, who was being treated at the Bispebjerg Hospital, Dep't A, for a tumor of the abdomen.

Roentgen ray examination with opaque enema showed an enormously distended rectum and sigmoid flexure. Orally, the barium shadow ended in a fork-shape similar to what we have seen in the radiographs just demonstrated. The patient was examined with clysma and opaque meal, and I concluded that the picture might be due to a pedunculate tumor or to a corpus liberum. An operation was performed, which brought to light an enormous coprolith — if I remember rightly: about 8 by 12 or 15 cm. large.

We cannot expect, of course, in all cases of invagination to get pictures that bring out all the details as clearly as those shown us by Dr. PANNER; and that is what I believe justifies me in using the case — of the coprolith — which I have just described, as an example to show that pictures similar to those we have just seen *may* be due to other causes than invagination.

2. H. J. PANNER, Copenhagen: I only wish to say to Dr. BAASTRUP that although the bifurcation of the enema-shadow is a characteristic feature, it is only the subsequent joining of the two branches of the fork — corresponding to the collar — which conclusively shows the nature of the lesion.

X. Hugo Laurell, Uppsala: A Few Words on Annular Shadows in the Lungs

It would seem to be beyond doubt that the immense majority of elegant annular shadows in the lung tract in cases of tuberculosis of the lung form the expression of tuberculous caverns. Of late years, however, the question has been actively discussed whether such annular shadows as rapidly diminish or disappear — so rapidly that we can scarcely imagine the diminution to be caused by the shrinking of a scar — may not be expressions of other processes. In particular the idea has been put forward of the possibility of localized spontaneous pneumothoraces and ring-shaped localized pleurisy.

The writer does not wish to deny that a localized spontaneous pneumothorax may in rare cases give the picture of an elegant similar shadow which may rapidly vary in size; but he considers that we should also take into consideration other possibilities with regard to the rise of such shadows. (1) In the opinion of the present writer annular shadows may arise and disappear with changes in the pressure-conditions in the tuberculous caverns; (2) They may possibly sometimes be due to large interstitial emphysematous bubbles, and possibly also to (3) substantial, large emphysematous bubbles exposed to hypertension.

1. The size of a tuberculous cavern is not solely dependent on the extent of the destructive process, but also to the dilating, elastic forces of the tissue in the surroundings of the cavern and to the air-pressure prevailing in the cavern in comparison with that prevailing in the surroundings. If an irregularly-shaped, thin-walled cavern happens to be exposed to hypertension through the coming into existence of an expiratory valve mechanism within the efferent bronchus, it follows that the cavern will become both larger and have more rounded walls, and that an atelectatic zone may make its appearance in the neighbourhood of certain parts of the walls of the cavern. Under such circumstances there may theoretically arise from an irregular cavern, which comes out indistinctly on the roentgenogram, a distinct annular shadow, partial or entire. On the other hand, an annular shadow which thus arises can naturally diminish, become indistinct, or disappear with the disappearance of the intracaverneus excess pressure; in such cases the disappearance of the annular shadow is not identical with the disappearance of the cavern, but an expression of less favourable conditions of projection, and possibly also of the disappearance of atelectatic zones near the actual wall of the cavern.

Even caverns which are under the same pressure as the surrounding lung-tissue, and so present the appearance of elegant annular shadows, may theoretically diminish quickly on a reduction of the pressure; in so doing they acquire a more

irregular shape. Such a reduction of pressure can arise if the afferent bronchus becomes completely obturated for some reason or other, in consequence of which the air in the cavern gets an opportunity of being resorbed more or less completely. But a complete disappearance of the cavern cannot be the consequence of the resorption of the air as long as the wall of the cavern still secretes pus and phlegm. From the very nature of the case, the elegant annular shadow may disappear in these cases, through the diminution of the cavern and the replacement of the air by pus and phlegm.

2. Experimentally, it is easily possible to produce by inflation of animal lungs great interstitial emphysematous bubbles. These bubbles come out in roentgenograms as annular shadows, because they are surrounded by a narrow belt of thickened atelectatic lung-tissue, in which the alveoli are pressed against one another like the layers of a bulb. Both large interlobular and purely subpleural bubbles can give such roentgen pictures. On inflation, there often arises in addition or by itself an extensive emphysema, interlobular and with small bubbles, the bubbles of which can be thrust into the chinks of the tissue. These small bubbles are not surrounded by any visible belt of density and often get blended together in the roentgen picture into narrow streaks of air, which can easily be confused with bronchi. If there are large bubbles at the same time as an extended emphysema of small bubbles, the latter may probably be easily overlooked.

In man also sections reveal the above-mentioned large, subpleural and interlobular emphysematous bubbles.

The writer exhibited roentgen pictures of children's lungs, sometimes with elegant annular shadows, enclosing a dark air-filled centre, and sometimes with rounded air-chambers in a pneumonically infiltrated lung, and he was inclined to interpret these air-chambers as interstitial emphysematous bubbles.

3. Large bullous substantial emphysematous bubbles do not usually stand out in roentgenological investigations, because the surrounding lung-tissue also has usually undergone emphysematous changes. Certain isolated bubbles of this kind, if subjected to hypertension, however, may probably sometimes give rise to formations which remind one of annular shadows or — when they are situated in or near a thickened lung-tissue (FISCHER's »Spitzennarbenblasen») — of small tuberculous caverns. These bubbles are considered to be due to an expiratory valve-mechanism, which is caused by a shrinking scar: they seem usually to be considerably smaller than the annular shadows that are most frequently observed in pulmonary tuberculosis.

XI. B. Werenskiold, Stockholm: A Contribution to the Diagnosis of Epiphyseal Separations

Genuine separations of the epiphysis without dislocation can be diagnosed by the detachment of a thin lamella from the diaphysis. This lamella lies in the interstice between the epiphysis and diaphysis and is found, as an assident symptom, in fifty-three per cent. of all mixed epiphyseal separations.

Genuine separations of the epiphysis are by no means rare. As a matter of fact, of all cases of epiphyseolysis radii, twenty per cent. are genuine separations. Nor do these cases of genuine separation occur only in small children. On the contrary, they are met with chiefly in the age of ten to twenty.

XII. Å. Åkerlund, Stockholm: Hernia diaphragmatica foraminis oesophagi

(1) Diaphragmatic hernia through the oesophageal hiatus may properly be termed »hiatus hernia». They are most often true, non-traumatic hernias and can be classified into three groups:

(a) Hiatus hernias with congenitally shortened oesophagus (»thoracic stomach»),

(b) Paraoesophageal hiatus hernias,

(c) Hiatus hernias not included in (a) and (b).

(2) A survey of the literature comprising 60 cases, besides the author's own collection of 24 cases, shows that hiatus hernia — contrary to the prevailing opinion — must be considered as a *relatively common* affection.

(3) Anatomically, but not roentgenologically, one can distinguish the real hiatus hernia from the rare circumscribed eventration of the diaphragm, the »diaphragmatic diverticulum» around the hiatus.

(4) In all the author's cases the hernia contained a greater or lesser portion of the stomach besides the abdominal oesophagus. The hiatus hernia is situated in the posterior mediastinum and can more or less project into either pleural cavity.

(5) Hiatus hernia is most often and easily roentgenologically demonstrated with the patient in supine or prone position or lying on his right side with pelvis elevated; sometimes it may be necessary to apply manual compression to the epigastrium.

(6) Roentgenologically the hiatus hernia appear as larger orsm aller (often minute) epidiaphragmatic recesses, having the shape of a ball, egg, bulb or loop, projecting from the shadow of the stomach, with which they usually have a wide communication.

(7) From the standpoint of differential diagnosis special mention may be made of *diverticula from the fornix ventriculi, diverticula from the distal end of oesophagus* and *insufficiency of the cardia* with filling of the abdominal oesophagus (»epicardia»).

Discussion:

1. L. Edling, Lund: I should like to express my sincere thanks to Dr. Åkerlund for the excellent account he has given of this interesting condition, which, so far, I have considered as of great rarity. I have only met with three cases, one of which was shown by me at the first meeting of the Swedish Radiological Society. This was probably the first of its kind to be radiographed in Sweden. The other two cases have been investigated this summer, the last one on the same day I left for this congress. These three cases demonstrate clearly the great difference in subjective symptoms associated with this condition, already pointed out by Dr. Åkerlund. I am now going to show you a few pictures of these cases:

Case 1. Male, aged 55. Since a couple of months difficulty in swallowing on account of some unpleasant sensation in the cardiac region on the passing of solid food. Condition otherwise good.

At the first roentgen examination attention was only directed to the oesophagus, the lowest part of which seemed narrowed and angularly bent. Carcinoma was diagnosed and not till afterwards did I notice on the plate a rounded gas-bubble behind the heart and above the diaphragm. I then made a further examination and found the hernia, big as a small orange, and including the greater part of the fornix but not the cardia.

Case 2. Female, aged 63. Since a couple of years diffuse burning pains in the abdomen after food. Nothing abnormal found on clinical examination. On roentgen examination a rounded hernia was found, about the size of a fist, involving the whole fornix and a small portion of the corpus as well as the cardia. The lower part of oesophagus was somewhat dilated. Judging by the pictures, it seems as if the hernia became reduced in standing position.

Case 3. Male, aged 42. For several years moderate abdominal discomfort a couple of hours after food. The trouble has become worse during the last 3—4 months and is described as an intense pain in the umbilical region, to a certain extent relieved by taking food. Chemical examination a month ago showed positive WEBER reaction. In consequence of this the patient underwent a modified course of treatment as for ulcer, but no relief followed.

Radiologically there was no sign of ulceration in the stomach or in the duodenum; instead, I found a para-oesophageal ventricular hernia, as big as an orange, involving the whole of the fornix, including cardia. The lower end of the oesophagus was somewhat wide and formed a bend round the posterior part of the hernia.

Finally, I should like to draw attention to one detail that ought to awake suspicions of the existence of a hernia, even were it to escape the eye in screen-examination in upright position, viz. the appearance of the stomach as being definitely short and small, provided the hernia has not been reduced. This was evidenced by the first and third of my cases.

2. A. SCHOLANDER, Hälsingborg: I can contribute another case to the collection. It was a woman, about thirty years old, who had suffered for some ten years from a phthisis pulmon. sin. It was not until the last year before the roentgen examination that the patient began to feel vague troubles after eating, partly from the heart in the form of a feeling of oppression, partly from the thorax in the form of splashing sounds, and finally troubles of an ulcer type.

On roentgenoscopy there was discovered a large gas-bubble, somewhat varying in size, in the lower, medial part of the left half of the thorax. When the patient had had contrast-meal the gas-bubble was filled with it, and it proved that above the diaphragm there lay, not only the oesophagus, winding very much in its lower part, but also the cardia and fornix and the upper part of corpus ventriculi. The patient refused to undergo an operation.

It is my conviction that the shrinking of the lung process on the left side had contributed to cause the hernia through the expansion of the hiatus oesophagus.

2. Meeting at the Building of the Scientific Associations

on September 2nd 1925 from 9—12 a. m. and from 1—4 p. m.

Teaching in Medical Radiology

Subject of discussion decided upon at the previous meeting

XIII. Gösta Forssell, Stockholm: Teaching in Medical Radiology

The speaker gave a survey of the origin and development of instruction in medical radiology in Europe and America, and added a more detailed account of that form of instruction in Sweden.

The development of instruction in radiology has been very largely dependent on the organization of radiological work and the development of radiological science in different countries.

Where roentgen work has been centralized within the hospitals, in a central institute common to the different departments of the hospital under the independent management of a specialist in the subject, there radiological science also has grown strong and the instruction has been well organized. Where radiological work has been split up amongst small roentgen laboratories, the instruction in radiology has also been inferior.

Roentgenological diagnostics have developed into a comprehensive special science and have attained a more and more extensive importance for all branches of practical medicine. It is now equally important for students to obtain some knowledge of this science as to learn microscopical anatomy, for instance. Radiotherapy, or the science of the employment of the different forms of rays in the service of medicine, has also grown to be a great and important science with its different branches — roentgen therapy, radium therapy and heliotherapy.

While heliotherapy, owing to its relatively simple technique and small risks, has become a general method of medical treatment, radium and roentgen therapy have become more and more specialized and require long and profound special studies for their expert practice.

In accordance with this, instruction in radiology has developed along two lines, inasmuch as on the one hand, general courses of instruction have been arranged for medical students in the principles of roentgen diagnosis, and on the other hand special courses of instruction have been arranged for those who devote themselves to roentgen diagnostics or radiotherapy as specialists or in their general practice stand in need of special knowledge in some part of these sciences.

The *United States of America* stand in the forefront in the development of instruction in radiology. In all the greater universities in U. S. A. there is well-organized obligatory instruction in roentgen diagnostics, with ordinary professors; and in the greatest universities there is excellent instruction for specialists in roentgen diagnostics and radiotherapy.

In *Europe*, *Sweden* probably takes the first place in the general instruction of students in roentgen diagnostics, which has been obligatory for all medical students since 1923.

Alongside of Sweden, *Italy*, *Rumania*, *Portugal* and *Hungary* have an organized obligatory course of instruction in roentgen diagnostics for students: and such instruction is also compulsory in some of the universities of *Russia*. In *Norway* this instruction is well organized, but it is still facultative.

In some of the great European countries the instruction of medical students in radiology is still in process of development, and this for many reasons which were explained by the speaker. Organized and obligatory instruction has not yet been put through in *Germany* and *Austria*.

In *England* instruction for specialists in radiology has been organized since 1920 by *Cambridge University* in co-operation with several of the other universities of England. Obligatory instruction for students is however being planned at all the universities of *England* and *Scotland*. *In France* the medical faculty of the University of *Paris* has since 1922 organized excellent courses of instruction in co-operation with the central institutes for radiology and medical electricity of the university hospitals. In *Italy* this instruction is organized on the lines of the Paris faculty.

In *Sweden*, in addition to the general and obligatory courses established in 1923, there have been since 1914 arranged regular continuation courses of a more special character at the Caroline Institute for more advanced students of medicine, who in their work in the hospitals have to concern themselves with roentgen diagnostics. The training of specialists in radiology is effected by the training of assistant physicians at the Roentgen Institutes of the Medical Faculties and of the Caroline Institute, and also of *Radiumhemmet*, which has played an important part in the development of radiotherapy throughout the Scandinavian lands.

Special instruction for *radiologists* in Sweden, however, still falls far short of instruction at the above-mentioned foreign universities; and it is highly desirable to develope that instruction much further in this country.

The speaker points out that the practical use of roentgen rays in medicine has in most places gone ahead of the instruction, in consequence of which fact many who employ the roentgen rays in practice lack the necessary theoretical and practical foundation.

In order that a sound development of radiology may be able to take place, the roentgen institutes of the universities must be organized not only for practical work, but also for instruction, and special laboratories for instruction must be equipped for research in the subject. The radiotherapeutic departments of the universities ought to be organized as scientific clinics for radiotherapy. The teachers of radiology must have the same standing as teachers in other special branches of medicine.

This is of importance not only for radiology, but also for the other branches of medicine, which to a large extent employ radiology as an auxiliary science, and not least for the sick themselves, who to a large extent need the help of radiology and have a right to demand some guarantees that those who practice this important and exacting speciality of medicine should be properly trained.

XIV. S. A. Heyerdahl, Oslo: The Instruction in Medical Radiology in Norway

Occasional instruction in radiology to the hospital physicians has been given by the writer, ever since the beginning of this century, at the Roentgen Institute of the Rikshospital.

The first course in radiology was started in the fall of 1915 as a free course for physicians and medical students, as the result of requests from various quarters, notably from the Director and physicians of the Rikshospital.

The course embraced roentgen technique and roentgen diagnosis. — It lasted about 2 months (20 hours in all).

During the following years, the writer held similar free courses for physicians and medical students every spring and autumn.

In 1919 a lectureship in radiology was established for the writer, at the University of Oslo, with the usual obligations for lecturers at that University.

The instruction in Radiology consists of two groups of courses:

Group I. Roentgen technique and roentgen diagnosis;

» II. Roentgen, radium and light treatment.

Instruction in Group I is given partly in the form of lectures combined with demonstrations; partly in the form of practical experience, through the student taking part in the work at the Roentgen Institute. — The *lectures* are held two or three times a week and can be concluded in about 20 or 25 hours altogether.

The lectures on roentgen, radium and light therapy are held successively, and are combined with the demonstration of patients or with lantern-slide pictures of irradiated cases. — A full series of these lectures will occupy about 18—20 hours.

This is the program according to which the instruction in radiology has been given since the fall of 1919.

By the decision of the Faculty, radiology is an optional discipline for the medical students.

Discussion:

1. H. J. PANNER, Copenhagen: In Denmark, radiology has not as yet been made a compulsory subject for the medical students. The interest evinced by them in this special study — at least as far as regards any desire on their part for a more thorough acquaintance with its details — has therefore been extremely slight — as will probably always be the case, more or less, with any subject in which there is no examination. With a very few exceptions the students have been satisfied with the knowledge of radiology which they gained through the clinical lectures and through whatever demonstration and explanation of roentgen plates took place in the course of the theoretical lectures, medical and surgical — of which it is only in the nature of things, however, that any such instruction must become only a subordinate feature.

For physicians, courses and lectures on radiology have been held regularly, during the last few terms, at the various hospitals and institutions. Dr. REYN, aided by his assistants, has lectured on photo-, roentgen and radium therapy once a week, and I have myself lectured, also once a week, on roentgen diagnosis. The audiences have mostly been made up of young physicians, with only a very few medical students, and the attendance has been small — about ten persons at each of the courses.

Besides, a course in radiology has been a regular feature, every year, of the post-graduate series of courses which are arranged, annually, by the General Association of Danish Physicians, in Copenhagen. This course is of six hours altogether, and the number of persons attending has generally been from six to ten, both medical practitioners and — especially — hospital physicians from the provinces. The course is held by a different chief of clinic every year: up to now they have been held by Dr. FISCHER, Dr. BAASTRUP and myself.

Of course, the need of a chair in radiology has grown apace, and last year the Medical Faculty, through the Governing Board of the University, urged the Ministery of Education very strongly to grant the establishment of an assistant professorship in that science; a request which was, however, declined by the Commission on the last Budget, on financial grounds. Still, as it is a demand which will no doubt continue to be made, the realisation of our wishes in that respect will probably be a matter of a not too distant future. Our idea is that the said assistant professorsship should be attached to the post of chief of the roentgen clinic of the Rigshospital.

In my opinion, attendance at one term of lectures in this discipline ought to be made compulsory on the medical students at the same time. Unless that is done, the usefulness of the intended step will probably prove illusory; for radiology will certainly not within any measurable time become a subject of examination, and the number of other subjects with which the student is required to familiarise himself is already now so great that, if it is left to himself whether he wishes to follow these lectures or not, they will probably be very sparsely attended; not necessarily from any lack of interest in the subject on the part of the students, but simply because their time is already so fully taken up with other, compulsory studies.

Another question which has to be settled concerns the exact time, within the period of medical study, at which this compulsory course of lectures ought to fall. A principal consideration in that respect must be that it should not come too early, because it is necessary that the student should already possess a certain amount of clinical and pathoanatomical knowledge in order fully to understand and benefit from the lectures.

A scheme of lectures like this should naturally comprise (a) a course of roentgen diagnosis and (b) a course of radiotherapeutics.

Before I proceed to speak of the manner in which these two courses ought separately to be mapped out, I wish to remark that, in my opinion, it would be unwise to devote too much time to problems of physical technique. It would hardly pay to do so. Of course, it will be necessary — especially when we come to the therapy — to touch on a number of physical problems, some familiarity with which will be required in order to understand the treatment; but beyond that it seems to me that it would be too great a waste of time in proportion to the benefit the students would derive from it, at the same time as it would unavoidably lead to a curtailment of the other, necessary — diagnostic and therapeutical — information which they ought to get in full. The technique is something which they can only learn by daily participation in the work on a clinic. To the manner in which I believe that side of the question might be arranged I shall come back in a few minutes.

A. Most time will probably have to be given to the course in diagnosis, because it will be necessary to give the students, within the term, as far as possible a fairly complete insight in the roentgen diagnosis of so wide a range of diseases as those of the bones, the stomach and intestine, the lungs and heart, and the urinary system. It may perhaps be possible, in the different terms, to dwell a little more at length on some one particular subject, either one of these or another; but, in the main, the program ought to be laid in such a manner that *all* the principal material is gone through *within each single term*. The course must be based partly on lectures, with plenty of demonstrations; and partly on »examinatoria» with plate reading.

B. The therapeutic course, comprising both roentgen, radium and phototreatment, embraces a field so overwhelmingly large that to go through it thoroughly

would require all the time that could, even in the best case, be devoted to the scheme in its entirety, and even more. It will therefore be necessary to confine this part of it to a description of the various kinds of rays and an explanation of the divers biological effects that account for their therapeutical applicability; this to be followed by a demonstration of the principal indications for that application under various circumstances, together with a mention of the more important diseases and groups of diseases which may, accordingly, become the subject for radiological treatment; and, finally, the prognostic possibilities of such treatment.

I cannot refrain from saying that, in my opinion, the two parts of this program have not the slightest intrinsic connection with one another. The only thing which they have in common is really the roentgen apparatus. As disciplines, each of them is large enough by itself, and for that reason alone it would probably be the most correct to have the therapy taught by some radiotherapeutic institution and the diagnosis by some clinic for roentgen diagnosis. But for the present we must, of course, count with the fact that, in most places, the two disciplines are bound together; and, besides, even as it is, we shall have sufficient practical difficulties to overcome, in our efforts to have radiology made a recognised part of the medical curriculum; and it will therefore be best — at least for the present — to leave the question of separation aside.

Even with the introduction of radiology as a compulsory subject for the students there still remains to be solved the important practical question of the administration of the many roentgen apparatus in the provincial hospitals. In Denmark, the physicians of those institutions generally have so much to do with the rest of their hospital work that, in most cases, they will have very little time to spare for roentgen examination and radiological treatment. It would therefore be an excellent thing if the young post-graduates who go out to the provinces, as assistant physicians at the hospitals there, were capable of undertaking that work. As I have already said, I do not believe that the compulsory course, with the time that can be allotted to it, will be able to give them any technical training worth mentioning; but that might be remedied — at least to a certain extent — if there could be created at the great hospital clinics (the number of which is already quite considerable) some places as assistants, merely to be held for the purposes of training, for a few — perhaps from three to six — months; and not as a substitution for the assistants already belonging to the staff, but as supernumeraries. With the knowledge of diagnosis and therapy which they have already acquired by attending the six months' course, a spell of service like this, as assistant in some clinic, would aid very considerably in completing the radiological training of these young physicians, with the result that the roentgen apparatus in the various provincial hospitals to which they might eventually be attached would undoubtedly be utilised to considerably better advantage than is the case at present.

2. S. A. HEYERDAHL, Oslo: In answer to Prof. FORSSELL's question concerning the organization of the practical work for voluntary assistants at the Roentgen Clinic of the Rikshospital I wish to say that the arrangement is for four voluntary assistants, at most, to be attached to the clinic at one time. They take part in the work of the clinic during two months, for at least two hours every day.

The voluntary assistants are distributed as follows: two of them work in the room for kidney, ureter, bladder and bone diagnosis, etc., while the two others work in the room for the diagnosis of lung, heart, stomach and intestine. After one month they change places. Besides this, they are as a rule present during the interpretation and description of the radiographs.

The screening is as a rule done by the physicians of the Clinic, who show and explain to the voluntary assistants what they see on the screen. The voluntary assistants also take part in the photographic work. In the course of the two months they usually acquire a fair amount of routine in the purely technical part of the work.

The courses in roentgen, radium and light therapy are held as lectures with stereopticon projections of cases treated. The biological and therapeutical effects of the rays are explained. These lectures occupy altogether about eighteen or twenty hours. They are intended particularly for medical students.

3. G. FORSSELL, Stockholm: I should like to ask Dr. HEYERDAHL as to one or two details in his plan of instruction.

(1) How is the practical instruction arranged for practitioners, who attend two hours daily for a period of two months? Is it possible during that period to teach them enough to enable them to make any practical use of it? Are they allowed to make fluorescopy, or to do any other work on their own account?

(2) How is the therapeutic course arranged? Is it not too much to assign six lectures to radium, six to roentgen and six to light therapy? On this scale the course in treatment seems to tend to become a special course in therapy and to be far too detailed for the practitioner.

I beg to thank Dr. PANNER for his contribution with regard to practitioners. If we could get one practitioner at a time at the various provincial hospitals, much would be gained for practical training. The necessary condition for this, however, is that the provincial hospitals should have special departments for roentgen diagnostics and treatment, well-equipped and under the direction of a radiologist.

At the present time we have central roentgen departments at sixteen hospitals in Sweden in which the roentgenologist holds the position of a head doctor, while five such departments are in process of organization. The need of central roentgen departments in the hospitals is very urgent, and the working results at the hospitals where there are radiological departments have aroused general satisfaction.

The head doctor in the roentgen department, however, must have a training that makes him capable of scientific work, and he must also be provided with the possibility of carrying out scientific work in his department. Thus he must have a hospital department at his disposition. At one provincial hospital, Örebro, there is at the present time being planned a department with sixteen beds, with possibilities of extension, and at Lund there is a department with sixteen beds.

With regard to Dr. PANNER's suggestion as to a possible division of the subject into roentgen diagnostics and radiotherapy, I should like to refer to what I have said in my introductory address, namely that diagnostics and treatment are, from a scientific point of view, as far apart as histology and light treatment. In practical work, however, it is natural that one man should have charge of both things, and for the present at least one professor in the subject ought to have charge of the development of the course of instruction. The time is not yet ripe for a division, though it is probable that in the future a division into two professorships will come about as a matter of course. At the present time, however, it is not advisable to split up the subject, and it seems not possible to get more than one professor of radiology in the medical faculties.

4. L. EDLING, Lund: Regarding the question of clinical assistantships, raised by HEYERDAHL and further discussed by FORSSELL, I wish to mention that ever since 1912 I have had an arrangement whereby a clinical assistant without salary

is appointed to my department by the University. This was the only help I had during several years, but in addition we have now the help of one salaried house-officer and one likewise salaried chief clinical assistant to the department. The appointment first named, lasting for about six months, has enabled the occupier to become familiar with all branches of radiological work, and has also given him opportunities of learning interpretation of plates and writing of reports. These assistants are often transferred to the salaried appointment. Next year I intend to shorten the appointment to 3 months to enable a greater number to take advantage of the training. I agree with Professor FORSSELL in his view that a greater number of men appointed simultaneously would interfere with the daily work.

A factor in connection with the compulsory training in Sweden and one which has given me a feeling of dissatisfaction, is, that the students are simultaneously very much burdened with work in other clinics. On account of this I have been under the impression that they have neither time nor strength to assimilate what is being taught them in the roentgen department, and consequently I have not thought fit to put them through any test-examination.

5. M. SIMON, Stockholm, related, how the work carried out by the clinical assistants is organized at »Sabbatsbergs Sjukhus» to enable them to be of more benefit and less trouble to the institution and also how they obtain practical experience in screening.

The clinical assistant is engaged for an average period of 3—4 months and is on duty 4—5 hours a day. For the first 4—6 weeks he attends the screening of all patients only as a spectator; having learnt to manage the screening apparatus, he is allowed to undertake examinations of lungs and abdomens — when doing the latter he begins with taking plates of the patient in supine or prone position, where the house-physician or I have made an examination of the patient in standing position or else he is allowed to complete an abdominal examination by taking further plates, if inspection of those already taken should prove this desirable.

In this way he gets good training even in more difficult details of the technicalities of screening at the same time as the patient is protected from any harm that might follow in consequence of the examination being left entirely into the hands of an inexperienced assistant.

It goes without saying that during the whole of his engagement he also takes part in inspection of plates and writing of reports.

The course of instruction has proved of great service to those who apply for the post as house-officers to hospitals where there is no roentgen specialist engaged.

XV. G. Jansson, Helsingfors: Case of Pneumo-Cephalus

The author describes a case of accumulation of air in the cerebral ventricles in association with fracture of the base of the skull. A labourer, aged 27, while cycling, happened to run into another cyclist and sustained a depression of the frontal bone and a fracture of the base of the skull. He has since the accident suffered from attacks of severe headache, dizziness and twitchings of the extremities. When in erect or sitting position he has occasionally noticed drops of clear fluid escaping from the nose.

Roentgenograms of the head showed the presence of two light, oval spots of large size within the skull, on each side of the middle-line at about the neighbourhood of the lateral ventricles. These areas extended forward as far as the frontal

bone engaging the sites of the anterior horns of the lateral ventricles. These pictures had the exact appearance of those obtained in ventriculographs, thus indicating the presence of air in the lateral ventricles. Judging from the frontal view, the air was confined to the anterior horns, which were considerably enlarged.

Operation and a subsequent post-mortem examination confirmed the roentgen diagnosis and gave valuable evidence as how the air had been able to reach the ventricles. The basal fracture had given rise to a crack in the lamina cibrosa with communication to the ethmoidal cells, and the severe contusion had caused an injury to the brain in the same region, thereby establishing a fistulous communication between the anterior horns and the opening in the lamina cibrosa.

XVI. Hugo Laurell, Uppsala: Roentgenograms of Ascaris in the Intestinal Canal

Ascarides can easily be demonstrated roentgenologically in the intestinal canal in the examination of the passage, as FRITZ was the first to show. They usually appear as defects in the filling in the contrast-meal, or sometimes, according to information received, through the presence of the contrast-meal in their own intestinal canal. The latter is straight, and its breadth is about one third of the diameter of the worm. Under normal conditions, the worms sit quite motionless in the jejunum. If they are driven by vermifuges to gas-holding parts of the intestines, they may there stand out against the gas as positive shadows.

In the jejunum, the normal haunt of the worms, they can easily be observed an hour or two after the contrast-meal, inasmuch as plicae Kerkringii enclose the worms so closely that only a thin layer of contrast surrounds and adheres to the body of the worm. Thus the worm stands out here as a central defect in the filling, shaped like a ribbon or a spool, and bounded by a thin streak of contrast: this is crossed at right angles by the more or less abundant collections of contents standing out as a strip of contrast between plicae Kerkringii. The worm usually lies stretched out in the longitudinal direction of the intestine, following its convolutions, and is not displaced by the peristaltic action. Its fixed position in the intestine would seem to be partly due to the muscular sense of the worm. For so long as the worm retains a shape corresponding to the convolutions of the intestinal loop it is, as it were, anchored in the intestines.

In the ileum, where the contrast-meal gathers more abundantly round the worm, compression of the part of the intestine that holds the worm is often necessary to make the worm visible. Here may not infrequently be observed worms rolled up into balls and worms lying in small wave-like bays. The writer had an opportunity of seeing such a worm in a slightly enlarged intestine, which was filled with a liquid that was mixed with a small amount of contrast-medium. It was natural to imagine that there was a local intestinal catarrh surrounding the worm.

When a number of worms lie closely packed together in parallel lines, they may completely fill up the lumen of the intestine, so that there is no normal relief of the mucous membrane in the form of visible plicae Kerkringii. The peristaltic action urges forward the contrast-medium above the heap of worms and between the different worms, each of which gets a thin covering of contrast-medium. In one such case (a two-year-old girl), with 199 worms, the whole jejunum was filled with ascarids in manifold layers, and yet there was no obstruction in the passage. In this case, as often, santonin proved to be an unreliable vermifuge, in as much as only a bare half of the worms were expelled, of which the females were in the

majority. The remaining worms on the day after the treatment lay partly in the ileum, but for the most part in the gas-containing caecum and colon ascendens, where they could be seen clearly against the gas. Here they rolled and wriggled about slowly. After some time all the remaining worms were expelled with Ol. Chenopedii: the males were now in the majority.

In a large percentage of Ascaris cases there are found only isolated specimens or a small number of worms. Cases of 100 worms and upwards form the exception.

The current view that the females are in a considerable majority in the intestines, is considered by the writer to be unproved. On the contrary, the sexes would seem to be, on the whole, equally strongly represented. This is of diagnostic interest, in as much as in that case we may expect to find males alone in about as large a number of Ascaris cases as females alone. The cases of Ascaris in which males alone occur are estimated by the writer (without prejudice) at about 20 %; and in these cases, therefore, roentgen should be able usefully to supplement the clinical search for ascaris eggs.

The literature of the subject speaks of an obturation form and a spastic form of ileus verminosus. The latter form of ileus the writer considers unproved. Objections can also be raised against the interpretation of many cases of what is known as obturational ileus in cases of Ascaris. The fact is that cases have been brought under that head in which there was no pronounced obstacle for the passage of the contents of the intestine.

The question still remains obscure as to whether the worms mainly eat the contents of the intestine or not. Reasons are brought forward for believing that the worms, at least to a large extent, live on the tissues and juices of the intestinal wall and thus constantly lacerate the intestinal canal.

For experiments in vitro ascarides expelled by santonin can properly be used, as they are not apparently affected by that poison. On the other hand, those expelled by Ol. Chenopodii cannot be used, as they are either dying or dead.

The worms are very sensitive to changes in temperature. If the temperature is reduced below 22° C., they become quite inert and helpless; after santonin, therefore, it would appear rational to use cold lavage to expel the worms form the colon.

The worms have little or no capacity to move in a cup, where they cannot push off from the sides of the cup; but on the other hand they can creep slowly in thin glass-tubes, where they throw their bodies into many curves, each of which thrusts against the side. In order to be able to move freely the worm evidently has to take up its abode in lumina whose walls fit comparatively tight round it even during the passage of the contents. That seems to the writer to be one of the reasons for their predilection for the jejunum.

XVII. H. J. Panner, Copenhagen: Some Remarks on Capsular Chondromatosis

After succinctly reviewing the opinions variously held concerning the nature of capsular chondromatosis, Dr. PANNER describes the characteristic roentgen picture, with the shadow formations — corresponding to the more or less calcified and ossified cartilage tumours — that are often found through the entire area of the capsule and the adjacent bursae, and the frequently existing, sharply circumscribed bone defects due to wear from the continuous pressure of the tumours projecting into the bony structure. He also calls attention to the fact that there is

no actual arthritis deformans; only at the angles of the bones small osteophytes are not infrequently seen, which must be taken to be secondary results of the presence of so many foreign bodies in the articulation.

Together with the rest of the clinical symptoms, the roentgen finding will, as a rule, easily determine the diagnosis in a sense contrary to the affections — arthritis deformans and bone tumours — with which the case might otherwise be confounded.

Dr. PANNER states, as his opinion, that the capsular chondromatosis — when the peculiarities of the disease have once been realised — will hardly be found to be as rare as hitherto supposed.

XVIII. S. Arnell, Boden: A Contribution to the Knowledge of Alterations in Shape Occurring in the Normal Ventricle

Demonstration of skiagrams of the ventricle on 60 healthy individuals (26 men, 34 women), at the age of 15—80 years. The photographs were taken in upright (standing), prone and supine positions, partly in dorso-ventral, partly in lateral direction. In this way one gets a good idea of the ventricular shape, which is subject to considerable changes. The dorso-ventral depth of the upper part is often strikingly large, particularly in elderly people when in supine position. It is probable that in some of these cases in supine position the corpus contributes to the formation of the great subdiaphragmatic sac. The difficulty of palpating a ventricular tumour with the patient, in supine position, is probably frequently due to the ventricle being drawn up into the upper and unapproachable part of the abdomen.

With the patient in supine position a ventricular fold is often visible across the dorsal aspect, between the sub-diaphragmatic sac and the part of the corpus, situated in the long axis of the body; it is of importance to recognize this, as it may be taken for a spasmodic contraction. It is in all probability a non-active fold.

The modifications in shape caused by the respiration are remarkably small. At the inspiration the ventricle will shorten in cranio-caudal direction and the angle between that part of the corpus, situated in this position and the sub-diaphragmatic sac, will be more acute. This is particularly applicable when the body is in supine position.

XIX. F. Nordrum, Sandefjord: A Case of General Osteitis Fibrosa

The speaker described a case of general fibrous osteitis in a female, aged 35, who had been admitted to the Tønsberg Hospital (Dr. PAUS) this summer, and he exhibited a number of radiographs, which showed characteristic structural changes in all the bones, both the long and the flat ones. He proceeded by mentioning the various theories that exist as to the nature of the disease, its relation to tumours and inflammatory processes, and ended by speaking of the great difficulty in the matter of its diagnosis.

Discussion:

G. FORSSELL, Stockholm: In connection with the case demonstrated, I would beg to be allowed a brief account of a couple of similar cases, which I have had the opportunity of observing and which may be of general interest.

These cases concern the appearance of ostitis fibrosa in two brothers. This disease is a typical ostitis fibrosa generalis. The first brother came to see me about a swelling of the bone with uncertain diagnosis, and was found to have an ostitis fibrosa, mainly confined to the left lower leg, the pelvis and the spine. When I was taking down his history and enquiring as to the possible existence of bone deformities in his family, the patient told me that his brother's head grew so much that he had to buy bigger hats every year. The brother came to be examined and was found to have a widespread ostitis fibrosa in the same parts as his brother, but also with great changes in the skull and marked nervous symptoms in consequence of compression of the base of the skull and of the spine. The day before I left home the *sister* of these brothers came to me about a glandular tumour on the neck. On both sides of the neck she had glandular swellings, on the left side a firm bundle of glands as big as a hen's egg adherent to the bottom of fossa supra clavicularis. A considerable density of the mediastinum and rounded tumour shadows near the mediastinum were observed on the right side on fluoroscopy. The patient had lost a good deal of weight and had had pains along the arms and down the legs.[1]

The clinical picture presented by the disease is most like a mediastinum sarcoma with metastases on the neck. But, of course, a similar picture can be obtained in case of lymphogranulomatosis or in metastasizing cancer or sarcoma, possibly from the alimentary canal. However, there are no clinical signs of primary tumour in any other place. The case will be further examined. If we have here a sarcoma, as is most probable, we have the interesting combination of two cases of ostitis fibrosa and one case of sarcoma in the same circle of brothers and sister. The WASSERMANN is negative in the brothers, and there are no clinical symptoms of lues. The brothers are about sixty years old, and have had symptoms for at least ten years. The sister is fifty-five years old and has had the symptoms for about one year.

A family combination of ostitis fibrosa with sarcoma seems also to be of interest in the light of the clinical transition-forms of this disease and sarcoma in some individuals.

The entire character of the disease in ostitis fibrosa seems to me to be an interesting example of other clinical border-forms between chronic inflammatory tumours and malignant growths, as, for instance, in different forms of lymphogranulomatosis. These phenomena appear to me to support the view that probably malignant tumours are caused by a living virus, which demands certain conditions in the organism for its development.

XX. E. Berven, Stockholm: The Treatment of Cancer Buccae

1. Buccal cancer is a comparatively rare disease. It is extremely malignant, with a marked tendency to disseminate both on and beneath the surface. Meta-

[1] Roentgenexamination of the skeleton on the 15th of September revealed typical ostitis fibrosa of the skull, the spine, the pelvis and the legs.

stases occur generally at an early stage. Many methods of treatment have been attempted.

2. From surgical treatment freedom from symptoms after three years has been obtained in about 15 % of the cases.

3. Roentgen treatment alone has given bad results.

4. Radium treatment, or a combined radium and roentgen treatment, has given varying results according to the development of the technique at different clinics. According to the latest statistics of the Memorial Hospital freedom from symptoms for two years or more has been obtained in 35 % of the cases (fifteen cases treated with »buried emanation»). The statistics of Radiumhemmet covering all cases treated 1909—1925 (44 cases) show freedom from symptoms for four years and more in 18 % of the cases. Of the 8 cases which were published in 1917 freedom from symptoms for ten years was obtained in 35 % of the cases.

5. Electro-coagulation has given freedom from symptoms after two years in about 36—38 % of the cases. (Statistics of Clark and Radiumhemmet on 21 and 19 cases respectively.) Thus electro-coagulation seems to give about the same percentage of cures as has been obtained with radium treatment at those clinics which have a highly developed technique and which have very large quantities of radium. But electro-coagulation seems to have certain advantages over radium treatment:

(1) It is easy to carry out.

(2) It gives immediate relief to the patient and involves no severe reaction and no risks of secondary atrophy and necroses.

(3) It gives apparently a smaller number of local recurrences than radiological treatment does.

Electro-coagulation, however, suffers from a certain percentage of primary mortality owing to the operation itself or consequent operations (16 % in the statistics of Radiumhemmet).

6. The occurrence of obvious glandular metastases aggravates the prognosis highly both in electro-coagulation and in radiological treatment. The best treatment of glandular metastases is apparently a combined surgical and radiological treatment, namely, dissection of the glands followed by implantation of seeds and a postoperative distance radium-treatment with massive doses and heavy iltration.

XXI. S. N. Bakke, Bergen: Roentgen Treatment of Polycythemia (Vaquez' Disease)

Dr. BAKKE reports a case of polycythemia treated by roentgen rays. At the beginning of the treatment the patient's blood picture was as follows: red corpuscles, 10,500,000; hemoglobin percentage 161; white corpuscles 18,800; leucocytes: neutrophile, 90.8 per cent; eosinophile 3.3 per cent; mast-cells, 0.4 per cent; lymphocytes, 2.3 per cent.

After thirty irradiations, extending over five weeks and covering all the tubular as well as the short and flat bones, and likewise the spleen, the number of red corpuscles had gone down to 7,000,000, and the amount of hemoglobin to 120 per cent.

After another two months, during which no irradiation took place, the number of red corpuscles had decreased still further, to 4,160,000; the hemoglobin

percentage to 91, and the number of white corpuscles to 3,700. In all other respects the blood picture was normal.

Four months later a slight increase was noticed: to 5,500,000 red corpuscles and 110 per cent. of hemoglobin. Now, however, the climateric has been reached, and this may possibly account for the increase.

XXII. A. Soiland, Los Angeles, U. S. A.: The Cancer Problem of the Female Breast[1]

(1) Cancer of the breast, when recognized as such, is a surgical dilemma which very frequently taxes the judgement of the skilled clinician.

(2) In primary localized cancer of the breast, surgery is the best remedy, yet radiation's present claims must be given respectful consideration.

(3) In other types of breast cancer, radiation is rapidly assuming first position, with surgery as a close synergist in selected cases.

(4) The present high level of surgical achievement follows centuries of application and experience. Therefore, it is difficult to visualize any immediate change in results from this source.

(5) Radiation is scarcely thirty-five years old, and it is certainly reasonable to expect rapid and definite advance in this science, admitting that our knowledge of its possibilities is exceedingly limited.

(6) In our present helplessness to stop the ravages and intense suffering of advanced cancer, it is not unreasonable to demand laws which will give to properly authorized institutions the humane right to give such cancer sufferers merciful and eternal peace.

(7) The attached summary of cases has been carefully prepared from our records, and we believe it to be correct.

XXIII. H. Nitter, Skien: Roentgen Treatment for Hypertrophy of the Prostate

A report on 21 cases of hypertrophy of the prostate treated by roentgen rays. In six of these cases the irradiation treatment failed to bring about any improvement in the condition of the patient, and eventually operation had to be resorted to, consisting, in four of the cases, in prostatectomy, and in the two others of a suprapubic incision with introduction of PEZZER's catheter. The enucleation, in the four cases, did not present any difficulty, and the bleeding seemed to be less than what is usually the case in this operation, which may possibly be ascribed to the effect of the roentgen-rays.

In fifteen cases the retention was overcome. After-examination gave the following results: in seven cases personally after-examined the amount of residual urine varied from 150 c.c. to 5 c.c., the average being about 50 c.c.; two of the patients have since been treated anew, after six and eighteen months, respectively, during which interval they had been free from symptoms; of one patient there is no information; and of the remaining five the report, either from themselves or from their physician, states that there has been a considerable mitigation and, to

[1] Published in *Acta Rad.* Vol. IV fasc. 5 page 391.

a great extent, a complete disappearance of their subjective urinary troubles, such as pains and over-frequent micturition. Examination of the urine from all the patients shows that only in four cases was there a total absence of albumin or pus. In all the other cases the tests showed the presence of small quantities of pus, and of albumin corresponding to those quantities. Among our cases there were two which relapsed, six and twelve months, respectively, after the first treatment. They have both been treated afresh, with good result. On the whole, the general health of all the after-examined patients has been very good; and of several of them it is expressly stated that they have been able to work at their various professions after ended treatment.

Technique. — Irradiation through 3 fields: one over the symphysis, one over the perineum, and one over the os sacrum. In each field 1 HED was given — distributed over two single irradiations — through a 0.5 mm. copper filter and with a skin-focus distance of 35 cm. In irradiating the perineal field the scrotum and testicles were included in the field, while the anal orifice was kept covered with a piece of lead-rubber, 5 by 5 cm., in order to protect the mucosa of the rectum.

XXIV. J. Heyman, Stockholm: Experiences with Radiological Treatment of Cancer of the Corpus Uteri at "Radiumhemmet"

During a period of 10 years — 1913—1922 — 69 cases of cancer of the uterine body have been treated; 22 of these have been under observation for 5 years or more; 42 % were inoperable, 36.2 % technically operable (operation contra-indicated or technically difficult), and 21.7 % operable.

The following results have been obtained in the treatment of those cases which have been under observation for at least 5 years:

Out of all the 22 cases 12 were free from symptoms after 5 years (54.5 %).
Out of 9 inoperable cases 4 were free from symptoms after 5 years (44.4 %).
Out of 13 technically and clinically operable cases 8 were free from symptoms after 5 years (61.5 %).

On account of the small number of cases treated it is of course necessary to be very cautious in drawing any conclusions. The figures obtained from a greater number of cases (1913—1922) observed for a shorter time show indeed that the 5 years result, as far as can be judged at present, will be less favourable, particularly in the inoperable cases.

In comparing the results obtained at »Radiumhemmet» with radiological treatment of cancer of the corpus with the average results obtained by operation one seems justified in drawing the preliminary conclusion that the former method of treatment yields as good results as the latter without entailing the immediate risk associated with this.

XXV. R. Holmsen, Oslo: The Need of Some Simple, Uniform Safety Regulation for the Installation of Roentgen Plants

The speaker calls attention to the great number of small outfits that are gradually being installed everywhere, and takes occasion of this to suggest that

some system be introduced by which such installations should be subject to approbation, not only as regards a proper certificate for the new plant, but also as regards a regular inspection and approbation of its manner of upkeep. From his own experience he gives a number of details which he believes might usefully be considered in connection with the creation of a set of rules to this effect. In formulating these rules, a special point should be made of aiming at protection not only against the roentgen rays, but also against the development of O_2 and NO_2, and against electric shock. Finally, regard should be had to the economic side of the matter, by endeavoring to secure the most effective protection for the machines and accessories.

XXVI. G. Jansson, Helsingfors: On the Question of the effect of Roentgen Rays on Blood-vessels

The author has made investigations concerning the influence of roentgen rays on the absorption through the capillary endothelium. To this end he made use of subcutaneous injections of a non-transparent solution, Alival (iodine-hydroxyprophan), and by observing the shadows disappearing by a series of radiograms he could follow its absorption. In so doing he found that after exposing a part to radiations with 1. HED through 1 mm. Al. or 0.5 mm. Cu. the Alival-shadows disappeared much quicker, in comparison with other parts of the subcutis not so exposed. This difference, quite pronounced in some cases, but less so in others, was observed both 2 and 4 days after application of the rays, whereas no difference was noticed at an injection 12 days after such exposure. The iodine-solution is diluted and also possibly absorbed quicker in a part that has been exposed to the rays. There is a more rapid exudation of fluid from the vessels to the hypertonic solution and probably an increased transference of the iodine compound to the blood. It would seem clear, therefore, that the effect of the roentgen rays is to increase the permeability of the vessel-walls, thus causing a disturbance of the exchange of materials between the tissues and the vessels.

The author has not been able to demonstrate such changes in vessel-walls of the non-exposed parts of the body. He thinks it quite likely, however, that a general increase of the permeability may occur, although it is not disclosed during a local test with the iodine solution. The joint effect of a general increase of the permeability of the vessel-walls may show itself in a disturbance of the intermediate metabolism. Such disturbance has also been demonstrated by several observers, especially in reference to sodium-chloride. The author makes the suggestion that this change in the vessels with its consequent disturbance of the osmotic regulation in the body may be an additional factor in the causation of general malaise sometimes occurring in the treatment by roentgen rays.

According to the experience of the author the secondary radiations in the blood are of no account in producing the above related change of the vessels.

XVII. P. Amundsen, Oslo: A Case of Fibromatosis Cutis Cured by Roentgen Treatment

Demonstration, on the screen, of two pictures showing the result of roentgen treatment in a case of fibromatosis around the external malleolus. The patient was a boy 15 years old. The cure was effected after ten series of ½ HED, given in the course of twenty-one months.

XVIII. Hugo Laurell, Uppsala: Roentgen Symptoms in Abdominal Discharges

I. Roentgen Symptoms in free Exudations and Transsudations in the Abdomen

If gas or free fluid becomes lodged between the intestines, the latter assume — especially in their stage of rest — a more regular cylindrical form than they normally possess. The normal angular form of rest of the small intestines can often be observed by roentgen in small children, because their intestines often contain gas. A pathological rounding of the intestinal lumina and bends under the influence of free fluid can be seen (supposing the rays are directed in a suitable manner) if the intestines are meteoristic: as, for instance, in a number of ileus forms with free exudation or transsudation.

If there is a small discharge in the abdominal cavity, clinically not demonstrable, the streaks of liquid lying between the abdominal wall and the meteoristic small intestine can, with suitable direction of the rays, be observed as small wedge-shaped shadows. These can be most easily demonstrated in the left flank. Sometimes a number of such wedges of liquid are connected with a narrow layer of fluid lying near the abdominal wall, so that the shadow of the liquid forms a comb-like picture. Streaks of fluid between two parallel intestinal lumina that contain gas help to bring out broader interluminary bands of shadow than are normal. Wedge-shaped shadows and streaks of exudation can especially be observed in the case of inflammatory exudations, because they are often accompanied by extensive meteorism of the intestine.

The subperitoneal layer of fat which is usually visible in the flank between the ntestines and the abdominal musculature may, in the presence of exudations and transsudations in the abdominal cavity, be more or less powerfully infiltrated and therefore form greater shadows than is normal. In that case it depicts itself more indistinctly than is normal, but this may also be helped by other factors. If the infiltration of the abdominal walls is extensive, the various layers of muscle and fat of the abdominal wall can blend together into a homogeneous shadow. If a discharge, e. g. ascites, immediately surrounds the spleen and liver or parts thereof, the boundaries of those organs cannot be seen, or can only partly be seen, in the roentgenograms.

In the case of abundant ascites it is often possible to see, if a roentgen photograph is taken of a patient in a recumbent position, that within the left flank the abdominal wall, which is abnormally lateral-convex, surrounds, and almost imperceptibly blends together with, an unusually compact and homogeneous shadow, which lies inside and which is largely formed by the discharge. On investigation of the passage of the contrast it can be observed that the contrast-filled small intestines lie more loosely than is normal, and that, in the case of large ascites, the small intestines do not reach the lateral wall of the abdomen.

In the left flank-tract it can also be observed that the intestines filled with contrast-medium have a freer passage mobility than is normal. They are floating in the fluid.

In the case of great discharges in the abdomen the diaphragm stands high. In such cases the diaphragm may also show a diminished mobility, the degree of which is connected, amongst other things, with the character of the discharge. In certain cases, if the body is in an erect position, there can be seen a flattening

of the cupola. It is probable that there are several factors, varying from case to case, that contribute to this flattening, which may be more or less strongly pronounced. Such factors may be the hydrostatic pressure, the laxity of the diaphragm, adherences in the posterior and lateral parts of sinus phrenicocostalis, and atelectasis in the posterior parts of the lungs.

In cases of acute diffused peritonitis the diaphragm is gradually enfeebled. Free gas in the abdominal cavity and pleural discharge are other indirect and secondary symptoms in acute peritonitis. Discharges in the abdomen of various kinds are often accompanied by a pleural discharge, one-sided or two-sided. Such a discharge can arise, *inter alia*, in acute peritonitis, pancreatitis, intra-abdominal bleeding, tuberculous peritonitis, cancerous peritonitis, decompensated vitium and affections of the kidneys.

In pneumoperitoneum intra-peritoneal levels of fluid can be observed in the presence of abdominal discharge. In such cases too — if the examination is made in a recumbent position — there can be observed in certain forms of ascites a characteristic bundle of omentum majus, e. g. in peritonitis tuberculosa and carcinomatosa. This bundle is often interpreted as an expression of a shrinking process. It seems to be natural to suppose that, at least in certain cases, another factor may be of great importance. In an upright position of the body, it is obvious that the highly fatty omentum must, in the presence of an abundant quantity of free fluid, swim up towards its surface. Thus there is formed there an omental bundle which in the presence of inflammatory changes may be welded together into an omental tumour.

If there is free fluid between dilated intestines, the latter cannot, to the same high degree as when there is no fluid, bring about a relief of the intestines which is visible externally on the abdomen.

II. Roentgen Symptoms in Burst Abscesses

A burst abscess in the abdomen can present the appearance of a homogeneous shadow, surrounded by intestines heavily charged with gas. If the remains of an abscess are localized in one flank, several of the symptoms above discussed — meteoristic, abnormally rounded parts of the intestine, wedges of exudation between the intestines, and infiltration of the layers of the abdominal wall — may be worthy of attention, and also the indirect symptoms that can arise through the pressure and deformation of adjoining intestines.

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1ST INTERNATIONAL CONGRESS OF RADIOLOGY, JULY 1925

At meetings of the delegates held at this Congress the following resolution were passed:

1. That this Congress in London is the First International Congress of Radiology.
2. That Mr. THURSTAN HOLLAND is elected President; and that at future Congresses the delegates shall elect the President on the nomination of the Country holding the meeting.
3. That future International Congresses shall be held at intervals of three years, or at such interval as the delegates at each Congress shall decide.
4. That the next Congress shall be held at Stockholm in 1928, and that Professor GÖSTA FORSSELL shall be the President, on the nomination of the delegates from Sweden.
5. That any Country having a Radiological Society (or Societies) shall be entitled to send not more than five (common) official delegates to each Congress. but only one vote shall be exercised by each Country.
6. That the Country in which any Congress is held shall be entirely responsible for all the Congress arrangements, financial and otherwise.
7. That Professor GÖSTA FORSSELL be appointed Chairman; Mr. THURSTAN HOLLAND, Vice-Chairman, and Dr. STANLEY MELVILLE (Secretary General of the London meeting) Secretary of the International Delegate Committee until the next meeting of the delegates.
8. That these resolutions shall be forwarded to the Editors of Radiological Journals with a request for their publication.

Signed on behalf of the International Meeting of Delegates.

C. THURSTAN HOLLAND, President.
STANLEY MELVILLE, Secretary.

ERRATUM

In Dr. A. SOILAND's article in Fasc. 5 of this volume the title of Group II B. 4. on Page 395 ought to be »Cases showing *no* pathology. 60«.

NEWS ON THE BOOKSHELF
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